

Chapter Four – Affected Environment (Present Conditions in the Project Area)



AFFECTED ENVIRONMENT

4.1 Chapter Introduction and Organization

This chapter of the DEIS presents a description of the existing environmental features and conditions occurring in the I-66 project area for the purpose of providing an overall understanding (big picture view) of study area characteristics, and to provide a baseline for the evaluation of potential environmental impacts, as detailed in Chapter 5.

Chapter Organization:

Environmental features described in Chapter 4 are grouped into three main categories:

- Section 4.2 - the Natural Environment,
- Section 4.3 - the Social Environment, and
- Section 4.4 - Cultural Resources.

For features within these categories, discussion generally consists of a description of the methodologies used to assess conditions, followed by description of the existing conditions noted in the area based on secondary source review and field studies.

4.1.1 Early Environmental Work

The environmental work conducted on the I-66 Somerset to London project was accomplished in two stages. The early environmental work, referred to as Phase 1A, presented an overview-level inventory of resources within a broad study area. The study within a 5 mile wide corridor in Pulaski, Laurel and Rockcastle counties identified environmentally sensitive resources to assist in refining the corridor for the subsequent extensive environmental studies. The Phase 1A studies consisted of literature reviews, windshield surveys (driving the corridor and documenting observed resources) and some field surveys. The Phase 1A studies were documented in summary reports to KYTC (Phase 1A Historic Structures, Ecology, Hazmat, Socioeconomic). The summaries included tabular and graphical accounting of resources within the project area and were presented to the public for comment. The resource identification, early agency coordination and public input aided in narrowing the large study corridor to 1000 ft wide study bands. The findings of the Phase 1A studies were incorporated into the final

baseline reports. The baseline reports are technical documentation covering; Air Quality, Archaeology, Hazardous Materials, Historic Structures, Karst, Socioeconomic, Highway Traffic Noise, and Terrestrial and Aquatic Ecosystems. The survey findings of these studies are included in the information presented in this chapter and were used in determining project impacts presented in chapter 5.

4.2 The Natural Environment

4.2.1 Physiography, Geology and Soils

Physiography

The Physiography of Kentucky can be grouped together based on similarities through the analysis of the patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken¹ 1986; Omernik 1987, 1995²). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another. The United States Environmental Protection Agency (EPA) defines these groupings as ecoregions. The EPA uses the ecoregions concept to determine attainable biological, chemical and physical attributes of aquatic resources occurring within a particular region and to develop management strategies for those resources. The ecoregion designation allows the EPA to have a framework for identifying what the conditions of the resources should be, based on regions of the same type, and to expend resources and assist management efforts in a manner consistent with the region to ensure long term viability.

Kentucky contains seven ecoregions (see figure 4.2.1-1) based on mapping from Omernick and the USEPA. The I-66 Somerset to London project is within three of these ecoregions; the Eastern Highland Rim, the

Plateau Escarpment and the Cumberland Plateau. The Eastern Highland rim is a subset of the Interior Plateau ecoregion. The Plateau Escarpment and the Cumberland Plateau are subsets of the Southwestern Appalachian ecoregion.

The western-most portion of the project is in the Eastern Highland Rim ecoregion. This ecoregion is unglaciated land consisting of variably dissected, undulating plains and hills. Steep bluffs, springs, cascades, and wide bottomlands are found along the Cumberland River and some of its tributaries. Karst areas occur within this ecoregion. Low to moderate gradient streams are common. Riffles have cobble or gravel substrate. The land use is forest, woodland, pastureland, and cropland. Crops include logging, livestock, dairy, corn, soybean, small grain, and hay farming. Oil and gas production are present in the ecoregion.

The majority of the project lies in the Plateau Escarpment and the Cumberland Plateau. The Plateau Escarpment ecoregion is unglaciated land consisting of Open low hills, ridges, rolling uplands, and intervening valleys. Streams have moderate to low gradients. The land use within this ecoregion is mostly forest or reverting to forest, but also including some pastureland and limited cropland. Logging, coal mining, and livestock farming have degraded water quality.

Past land use and topographic variation have contributed to today’s highly variable forest composition. Reclaimed and unreclaimed mine lands occur. On broad ridge tops and in valleys: some hay, corn, and tobacco are grown.

The eastern portion of the project is located in the Cumberland Plateau ecoregion. This ecoregion is unglaciated land containing highly dissected plateau with ridges, cliffs, hollows, knobs, and valleys. High gradient, fast flowing streams are common in many areas. The land use is mostly forest; limited cropland and pastureland. Logging, coal mining, and gas production have degraded stream quality. Past land use and topographic variation have contributed to today’s highly variable forest composition. Acid mine wastes have reduced or eliminated aquatic fauna (animals) in some stream segments. Reclaimed and unreclaimed mine lands occur. Steep slopes limit road building and logging. On ridge tops and in valleys: limited livestock, corn, tobacco, and hay farming.

Why do we need physiographic information? Physiographical information gives biologists and geological investigators a reference point with which they may compare the project’s findings to known trends for the area and similar regions.

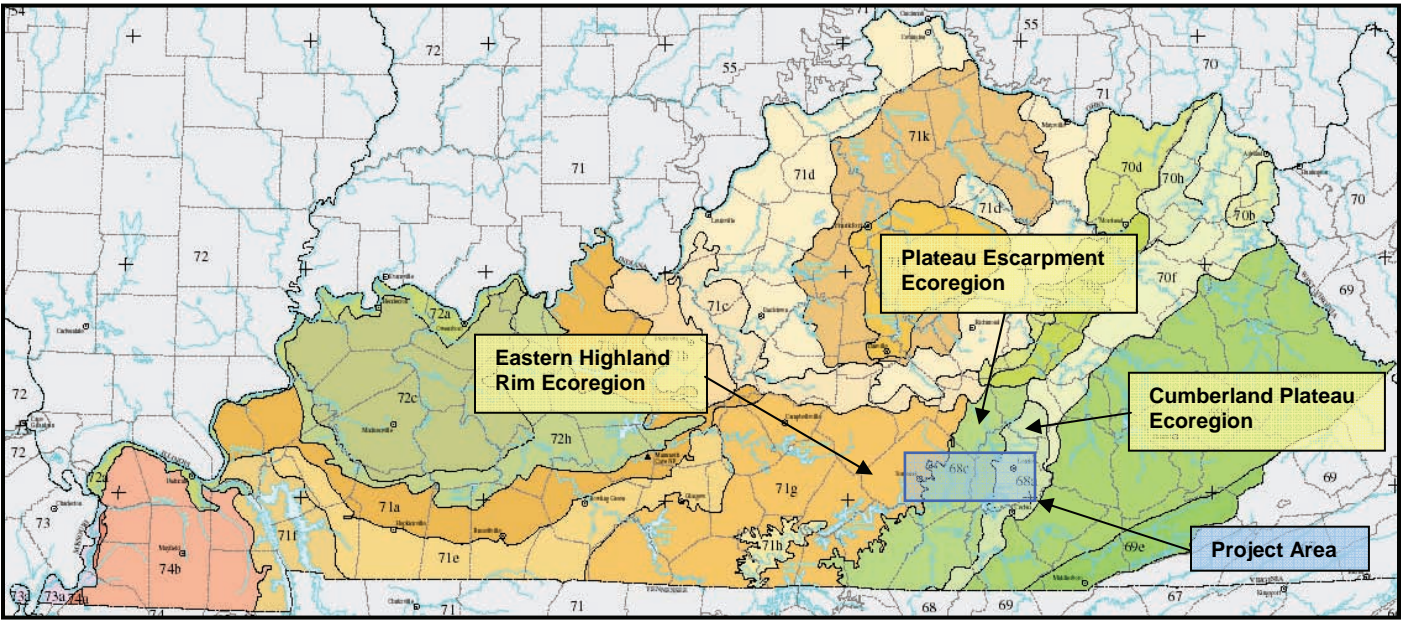


Figure 4.2.1-1 – Kentucky’s Ecoregions – Defining patterns of ecological similarity

Geology

Structural Setting

The study area straddles the junction of the Cincinnati Arch and the Appalachian Basin. The Cincinnati Arch is an elongate, north-trending structural flexure extending from Cincinnati, Ohio, through Cumberland County in southern Kentucky³. The arch is bordered by the Appalachian Basin to the east and the Illinois Basin to the west. The study area lies on the east flank of the Cumberland Saddle, a structural depression in the axis of the Cincinnati Arch between the Jessamine (or Lexington) Dome to the north and the Nashville Dome to the south (McDowell 2001). Structural contours shown on the Digital Vector Geological Quadrangle (DVGQ) and Geological Quadrangle (GQ) maps reveal the presence of numerous local and subtle bedrock flexures. In general, bedrock dips to the southeast at a rate of approximately 50 feet per mile in the Mississippian Plateau and approximately 25 feet per mile in the Cumberland Plateau portion of the study area. As a result of the overall southeastward dip, the strata (layers) exposed at the surface are generally younger to the southeast.

The study area also lies within the Rome Trough, a linear graben-like structure in the subsurface of eastern and central Kentucky, which is bounded on the north by the Kentucky River Fault System, on the west by the Lexington Fault System, and on the south by the Rockcastle River-Warfield Fault (Dever et al. 1990). The trough has been interpreted as part of a major graben or continental rift system extending from the Mississippian Embayment east-northeastward across Kentucky, West Virginia, and Pennsylvania, into south-central New York. Although the trough was formed mainly by Cambrian faulting prior to deposition of the Carboniferous rocks underlying the surface of the study area, subsequent displacements (intermittent growth-faulting of decreased magnitude and episodes of uplift) along bounding and interior faults of the trough manifest themselves in thickening, thinning, and erosion of some Carboniferous units (Dever et al. 1990). Several normal faults have been inferred in the study area. A westward dipping normal fault has been inferred between the Kentucky Stone Pulaski Quarry and Stab in Pulaski County based on thickness

variations in Mississippian rocks (Dever et al. 1990). A possible eastward dipping normal fault has been inferred along Kentucky Highway 80 at Halsey Rough about a mile west of the Rockcastle River based on a juxtaposition of upper Mississippian and lower Pennsylvanian rocks (Dever et al. 1990). A parallel, eastward dipping normal fault is also inferred along Kentucky Highway 80 beneath the Rockcastle River based on sharp declivity on magnetic and gravity surveys across the river (Dever et al. 1990).

Photointerpretation of alignments and field measurements of joint orientations indicate two well-developed joint sets in the Cedar Creek portion of the study area in south eastern Pulaski County. Morris (1983) developed a rose histogram that identified the major joint set orientation as N25E and N75W. Morris further related major cave passage alignments within Stykes, Blowing and Cedar Creek along these two trends. Similarly, Devilbiss (1988) mapped the major passage of Shipps Swallet Cave along the northeast-southwest trend. These relationships support the common theory that the karst features are principally joint controlled.

Stratigraphy

The study area is underlain by rocks of the Pennsylvanian and Mississippian Periods, which combined, are called the Carboniferous Period. The rocks of the Mississippian (or lower Carboniferous) are composed of sediments deposited in a marine environment 325 to 360 million years ago⁴. In ascending order, the strata generally range from basinal and prodeltaic shales and siltstones to shelf limestones and dolomites and coastal sandstones and shale, a pattern indicative of a widespread shallowing of the seas during Mississippian time (Grabowski 2001).

The rocks of the Pennsylvanian (or upper Carboniferous) are mostly sandstone, siltstone, shale and contain coal beds. These rocks are composed of sediments and organic matter deposited in the Appalachian Basin 290 to 325 million years ago⁵. These rock types indicate that Kentucky was near sea level, alternately covered by lakes, extensive swamps, shallow bays, and estuaries during the Pennsylvanian Period (Rice 2001). A regional unconformity surface,

marked by erosional features including paleokarst, separates the Mississippian and Pennsylvanian rocks across most of the Appalachian Basin (Chesnut 1993, Chesnut 1992).

Geologic mapping of the study area is available from the U.S. Geologic Survey (USGS) and the KGS. During the 1960s and 1970s, the USGS published 1:24,000 scale, 7.5-minute (GQ) maps of the study area. Scanned, geo-referenced images of the GQ maps were obtained from the Kentucky Infrastructure Authority's Web site.⁶

Soils

Most of the soils in Pulaski, Laurel and Rockcastle counties are acidic (USDASCSFS 1974, 1981). The area of Pulaski County in the Dissected Eastern Highland Rim region is underlain by rocks of the Fort Payne, Warsaw, Salem, St. Louis, and St. Genevieve Formations of the Mississippian System (USDASCSFS 1974). The Fort Payne Formation consists primarily of gray or greenish-gray shale and claystone at its base and ranges from 200 to 300 ft. in thickness. Cherty limestone, claystone and limestone lie above the shale. Beneath the Mississippian System lies the Devonian System, which is composed of Ohio Black Shale (USDASCSFS 1974). The soil associations found along the project corridor in Pulaski County are as follows: Frederick-Mountview, Frederick-Fredonia-Talbott, Fredonia-Talbott-Brookside, and Jefferson-Shelocta-Muse. The Frederick-Mountview association consists of “gently sloping to moderately steep, deep, well-drained soils on ridgetops and side slopes” (USDASCSFS 1974). Frederick soils have a light-colored surface layer, and a red, clayey subsoil, while the subsoil of Mountview soils are yellowish-brown silty clay loam in the upper part to a depth of about 30 in. with a mottled and clayey soil below. Soils of the Frederick-Fredonia-Talbott association are “gently sloping to steep, deep, well-drained soils mostly in valleylike positions, and sloping to moderately steep, moderately deep, well-drained, rocky soils on hilly uplands (USDASCSFS 1974).” Fredonia soils have a dark surface layer and a red, clayey subsoil. Rock outcrops consisting of Fredonia and Talbott soils are common. Soils of the Fredonia-Talbott-Brookside association are “sloping to moderately steep, rocky soils in valleys, and steep to very steep, deep soils on adjacent hilly uplands”

(USDASCSFS 1974). Brookside soils are deep, and well-drained with brownish, clayey subsoil. Soils in the Jefferson-Shelocta-Muse association are “sloping to very steep, deep, well-drained soils on very deeply dissected mountainous uplands (USDASCSFS 1974).” This association is deeply dissected by streams. Jefferson soils have a yellowish-brown, loamy subsoil; Shelocta soils have a brown, silty subsoil; Muse soils have yellowish-brown to strong-brown clayey subsoil (USDASCSFS 1974).

The soils of the Cumberland Plateau Region of Rockcastle and Laurel counties are underlain by siltstone, sandstone, and shale of the Pennsylvanian System (USDASCSFS 1981). Soils in Laurel County along the project corridor are of the Shelocta-Rigley-Latham and the Whitely-Latham-Lily association (USDASCSFS 1981). Shelocta-Rigley-Latham soils are “sloping to very steep, deep soils that have a loamy subsoil, on long side slopes; and sloping and moderately steep, moderately deep soils that have a clayey subsoil; on narrow ridgetops” (USDASCSFS 1981). These soils are found in mountainous regions with narrow ridgetops, and long, steep to very steep side slopes. Shelocta soils have a silt loam or silty clay loam subsoil. Rigley soils have a fine sandy loam surface layer and subsoil with coarse fragments. Latham soils consist of soft shale and have a silty clay or clay subsoil. Soils of the Whitely-Latham-Lily association are “gently sloping to steep, moderately deep and deep soils that have loamy or clayey subsoil; on ridgetops and side slopes” (USDASCSFS 1981). Whitely soils have a silt loam or silty clay loam subsoil in the upper part and silty clay loam or silty clay in the lower part. Latham soils have a silty clay or clay subsoil, and Lily soils have a sandy clay loam or clay loam subsoil (USDASCSFS 1981). The soils in Rockcastle County along the project corridor are of the Shelocta-Rigley-Latham association, which are “sloping to very steep, deep soils that have a loamy subsoil, on long side slopes; and sloping and moderately steep, moderately deep soils that have a clayey subsoil; on narrow ridgetops” (USDASCSFS 1981).

Why are soil types important? Soil types are important for determining wetlands and potential plant communities (acidic vs. basic soils). Soil types determine whether agricultural land is Prime Farmland per the Farmland Protection Policy Act. The erosive nature of different soils is important for water quality. The depth of soil over karst features is important from a geohazards perspective.

³<http://www.uky.edu/KGS/coal/webgeoky/kygeolgy.htm#structure>

⁴ <http://www.uky.edu/KGS/coal/webgeoky/Kygeolgy.htm#time>

⁵<http://www.uky.edu/KGS/coal/webgeoky/kygeolgy.htm#time>

⁶ <http://kymartian.state.ky.us/qpmaps>

Hydrology and Surface Streams

4.2.2 Floodplains

Floodplains in the I-66 project area were identified using Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). Impacts to the Significant Ecological Resources: Buck Creek and the Rockcastle River were assessed by calculating the acreage of the FIRM 100 year flood zone within the right-of-way for each build alternative. As FIRM 100 year floodplain data was not available for Sinking Creek at Alternative G, impacts to the Significant Ecological Resource: Sinking Creek were derived from the floodway as interpreted from review of project topographic mapping. Pursuant to Executive Order 11988 "Floodplain Management", the proposed project was determined to be within one or more of the 100 year floodplain of the following streams and rivers: Rockcastle River, Sinking Creek, Buck Creek, Flat Lick Creek, Stewart Branch, Line Creek and the Little Laurel River.

4.2.3 Karst Hydrogeology

Karst is a descriptive term for terrains with characteristic hydrology and landforms. Most karst terrains are underlain by limestone or dolomite, but some are underlain by gypsum, halite, or other relatively soluble rocks in which the topography is chiefly formed by the removal of rock by dissolution as a result of the rock solubility and other geological processes operating through time. Karst terrains are characterized by unique topographic and subsurface features. These include sinkholes; karst windows; springs; caves; and losing, sinking, gaining, and underground streams. The hydrology of aquifers underlying karst terrains is markedly different from that of most granular or fractured-rock aquifers because of the abundance, size, and integration of solutionally enlarged openings in karst aquifers. Most of the karst areas are underlain by carbonate rocks that have varying amounts of fractures. The fractures usually are enlarged by solution where they are in the zone of ground-water circulation. The enlargement of the fractures is controlled, in part, by geologic structure and lithology.

Groundwater recharge occurs as infiltration through unconsolidated material overlying bedrock or as direct inflow from sinking streams and open swallets. Springs are the discharge points and

usually are located at or near the regional base level or where insoluble rocks or structural barriers such as faults, impede the solutional development of conduits. Spring discharge is normally flashy, responding rapidly to rainfall. Flow is turbulent and turbidity, discharge, and temperature are highly variable.

Ground water in karst terrain occurs in both unconsolidated sediment and bedrock that may comprise a complex interrelated aquifer system. The nature of ground-water movement in karst terrain varies considerably from place to place depending on the nature of the aquifer system. The occurrence and movement of ground water in bedrock underlying karst terrain is quite different from that underlying non-karst terrain, primarily because of the presence of conduits that permit relatively rapid transmission of ground water. Groundwater flow in a mature karst aquifer is primarily through conduits. Groundwater in karst terrain, as in other terrains, moves in response to hydraulic gradients from points of recharge to points of discharge. The horizontal gradient of the ground-water surface, the general shape of the water table, and the general direction of movement can be determined from a water-level contour or potentiometric map. The contours are based on the altitude of the water level in wells, springs, and streams. The general direction of ground-water movement can be estimated by drawing flow lines perpendicular to the water-level contours. Results from dye traces can also be used to confirm the direction of ground-water movement shown by the water level contour map. The rate of ground-water movement is also important to the understanding and solution of many ground-water problems in karst terrain, especially to those related to contamination of the ground-water system in karst terrains. Results of dye tracing can define the rate of ground-water movement and the fact that the rate is not constant, but varies with hydrologic conditions. The karst aquifers in the I-66 project area most closely resemble the free-flow karst aquifer type of Mull et al (1988) which has the following characteristics:

- Developed in thick and massive soluble rocks where groundwater flow is concentrated in a well-defined and integrated system of enlarged conduits which behave hydraulically as a system of pipes.
- Flow velocities are similar to surface streams and are often turbulent.

- The regional discharge may occur through a single large spring.
- Because of the rapid drainage, the water table can be virtually flat for miles, with only a slight elevation above the regional base level.
- Water levels in the conduit network and spring discharge respond rapidly to recharge events. During periods of heavy precipitation the spring hydrography may resemble the flood peak of a surface stream.

Regionally, groundwater is a reliable source of drinking water for a large segment of the population. According to Lloyd and Lyke (1995) groundwater use for drinking water supply was about 205 million gallons per day. Based on this study, the fresh groundwater withdrawn in Pulaski and Laurel Counties during 1985 ranged from 0 to 5 million gallons per day.

Notable with regard to limestone aquifers in general and certainly applicable to the I-66 project area, are groundwater contamination issues including the following conditions documented by Lloyd and Lyke (1995):

“Contaminated and turbid water are problems that can plague the users of water from wells and springs in limestone aquifers. Sinkholes are sometimes used to dispose of solid and liquid wastes. Water that recharges limestone aquifers through waste-filled sinkholes can transport contaminants into the aquifer, and the contaminated water can spread rapidly through a system of interconnected solution openings until it reaches wells or springs. Solution features, such as swallow holes in streambeds allow sediment-laden storm runoff to enter the aquifers directly. Turbid water also can be caused by pumping of large-capacity wells, which results in the rapid movement of water through solution openings lined with silt or clay. Contamination and turbidity problems can become worse during periods of prolonged, intense rainfall.”

4.2.4 Local Karst Hydrogeologic Setting

Karst Terrain is a “Water Bank”

According to Carey and Stickney (2001), the karst areas of Pulaski County occupy the Mississippian Plateaus region which is a moderately to well-dissected upland, ranging in elevation from

approximately 1,150 feet at the western edge of the county to 950 feet at Somerset. The central portion of the County is characterized by sinkholes, sinking creeks, springs, and related subsurface drainage features. [See Karst and Geohazards Study (Gannett Fleming October 2004) for depiction of drainage features.] Valleys with subterranean drainage features indent the Cumberland escarpment in the Eastern Pennyroyal Karst region. Some of these valleys are perched above present drainage levels as the result of waters being diverted to underground drainage systems. The significant aquifers present in karst areas of the county and their associated properties include the following, according to Carey and Stickney (2001):

Bangor Limestone, Hartselle Formation, Kidder Limestone:

These formations create steep hillsides or underlie broad rolling karst areas and dissected uplands and can yield more than 500 gal/day from solution openings. Some wells produce more than 5 gal/min from large solution openings. Near outcrop areas, particularly near major escarpments, yields generally are inadequate during dry periods.

Ste. Genevieve Limestone:

The Ste. Genevieve underlies dissected karst areas in uplands and can yield more than 50 gal/min from wells. Wells that do not intersect solution openings generally are inadequate for domestic use. Springs having low flows ranging from less than 10 gal/min to more than 200 gal/min occur at or near stream level or near contact with the underlying St. Louis limestone.

St. Louis Limestone:

Thick limestone beds in the St. Louis Limestone form ledges and cliffs with resistant siltstone and nonresistant shale layers forming discontinuous minor benches on hillsides. This aquifer yields more than 50 gal/min from large openings in karst areas. Most wells penetrate some solution openings, but where openings are small yields are inadequate for domestic supply. A major spring horizon occurs near the top but many seepage springs occur throughout the formation. Spring flows range from less than 10 gal/min to more than 500 gal/min. The lower part of the formation is composed of siltstone and argillaceous limestone. Yields from these sedimentary rocks are low and generally are not adequate for a domestic supply.

Salem and Warsaw Formations:
These formations underlie moderately to highly dissected rolling uplands and yield enough water for domestic supply where they are dominantly limestone. Yields are low where siltstone or argillaceous limestone is penetrated. A minor spring horizon occurs at the contact of the limestone with the underlying siltstone or argillaceous limestone. Another spring horizon occurs near the contact of the Warsaw and Fort Payne. Low flows are generally less than 5 gal/min.

Borden Formation:
The Borden forms dissected slopes, massive siltstone forms cliffs, and limestone forms ledges on shale slopes in the Mississippian Escarpment. The formation can yield 100 to 500 gal/day for wells in valley bottoms and may yield more than 500 gal/day from fractured sandy rocks near streams. It yields almost no water to wells on hills. Water from wells drilled below stream level may contain salt, sulfate or iron less than 100 feet below the level of the principal valley bottoms. Water from dug wells and small springs is soft and has low dissolved-solids content. Water from shale is soft; from the siltstone, hard; and from the limestone, very hard. Because much of this formation is soft and silty, it has been well suited to the construction of dug wells in the past which generally produce less than 500 gal/day and often go dry in late summer and fall.

According to Carey and Stickney (2001) about 10,200 residents of Pulaski County rely on private domestic water supplies: 4,600 use wells and 5,600 use other sources. Additionally they report that of the 18 percent of the County population not served by public water, about 45 percent of the households use wells and 55 percent use other sources.

The Kentucky Geological Society (KGS) Kentucky Groundwater Data Repository contains records of 938 wells and 148 springs in the Pulaski County and only a few of the wells are noted as being used for public water supply. Of the Pulaski County water sources approximately 285 wells and 115 springs are situated within the USGS 7.5 Minute quadrangles (Ano, Billows, Bobtown, Dykes, Shopville and Somerset) surrounding the I-66 project karst area. Water quality data for these sources are maintained in the Kentucky Groundwater Data Repository for both organic and inorganic water quality parameters. The repository also maintains records regarding the physical

properties of these water sources. These data include information such as depth, yield, construction and use. Carey et al. (1993) provide additional data regarding Pulaski County water sources. According to Carey and Stickney (2001) water obtained from most drilled wells in limestone aquifers of Pulaski County is considered hard. Common salt and hydrogen sulfide are the two naturally occurring constituents most often encountered in objectionable amounts in ground water and, in general, deeper wells produce more mineralized water. However such wells are not as subject to pollution and bacterial contamination as water obtained from wells and springs in many limestone aquifers. Saline water is found below fresh ground water at elevations ranging from 700 to 1000 ft (Mean Sea Level). According to the Kentucky Division of Water, Groundwater Branch, Pulaski County has areas of moderate to high sensitivity to ground-water pollution as defined by the ease and speed with which a contaminant can move into and within a ground-water system.

4.2.5 Karst Groundwater Tracing Studies

Groundwater (dye) tracing was conducted by the University of Kentucky, Kentucky Geological Survey (KGS) beginning in November 2004. The purpose of the tracing was to identify and delineate the groundwater basins crossed by the project alternatives. As discussed in 4.2.3, groundwater tracing is a tool for determining the direction of groundwater flow, the rate of flow and the area draining to a specific spring in karst aquifers. The surveys were conducted in accordance with the Kentucky Geological Survey “Protocol for Qualitative Groundwater Tracing Using Fluorescent Dyes”⁷. The results of the studies provides data for a better understanding of the hydrogeology and provides KYTC with the knowledge necessary to avoid or minimize environmental impacts, while reducing project construction and long term maintenance costs.

To date the KGS has completed 44 groundwater traces and mapped an estimated seventy-five percent of the groundwater basins within the hydrologic project area. A much larger percentage of the groundwater basins traversed by the alternatives has been delineated.

⁷ KGS Protocol for Qualitative Groundwater Tracing using Fluorescent Dyes; Currens and Paylor, 2005

The karst aquifers in the hydrologic project area can be described as occurring in two settings; comparatively shallow aquifers in the west with conduit development perched on the interbedded shale and limestone of the Salem-Warsaw and in the east a thicker section of carbonates results in relatively deeper caves and conduits with substantial thickness of cover. The majority of the groundwater basins in the project area are graded to springs along the local base level stream, Buck Creek or its major tributary, Flat Lick Creek. Fifteen percent of the groundwater traces cross beneath a surface watershed divide. Examples include the Gardner Old Barn spring, Big Spring, and Elwood Spring groundwater basins (figure 5.2.7-1, Appendix C). All water carrying conduits are vulnerable to blockage by debris and sediment. Notable examples in the project area are Gardner Old Barn and Hargis spring basins. The parallel alignment of the roadways and the conduit poses a stability risk in Elwood spring basin. The hydrological basins and dye tracing results discussed here and in Chapter 5.2.7 are shown in figure 5.2.7-1 in Appendix C.

Karst Groundwater Tracing is an Ongoing Effort

The groundwater summary in section 5.2.7 and in the report “Delineation of Karst Groundwater Basins Along the Proposed I-66 Corridor, Pulaski County” are the result of a comprehensive survey of the groundwater basins in the project area. A limited number of additional groundwater traces remain to be completed during wet weather and will be included in the FEIS.

Other Aquatic Resources

4.2.6 Sole Source Aquifers

EPA designates sole source aquifers as those with highly productive aquifer yields and requires protection under Section 1424(3) of the Safe Drinking Water Act. There are no EPA designated sole source aquifers within the project area.

4.2.7 Surface Streams

The project area occurs in the Rockcastle and Laurel River sub-basins of the Upper Cumberland River Watershed. The Cumberland River originates in Harlan County, Kentucky east of the project area near the Kentucky-Virginia State line. The river flow is southwest through Bell County, then roughly west

through Knox and Whitley Counties. From there it flows north along the Whitley/McCreary County line before flowing generally west again along the McCreary/Laurel County line into Pulaski County and eventually into Lake Cumberland. From this point the river flows southwest into north-central Tennessee where it eventually turns back, flowing northwest, and re-enters Kentucky. It continues flowing northwest and eventually enters the Ohio River at Smithland, Kentucky.

Karst Information

Where is Karst Found?

Large areas of the United States are karst (20% of the contiguous states), and approximately 55% of Kentucky is underlain by soluble bedrock and karst aquifers.

Why is Karst Study Important?

Construction of any kind; housing, commercial, industrial, rail, pipeline or highways on karst is more costly because of problems with foundation stability, drainage and stormwater disposal and the potential for environmental damage from construction or the operation of the constructed facility. Knowledge of the karst in the project area allows for measures to be taken to avoid and/or minimize impacts in relation to karst.

Why is the Protection of Karst Aquifers Important?

In granular aquifers, water will usually filter slowly through a porous media (clay soils with small pore sizes) before it enters the aquifer. This “coffee filter” action provides filtration of contaminants in the water before entering the groundwater. In karst areas however, the surface and subsurface are closely linked and materials that run-off the surface may appear in the groundwater within minutes of sinking beneath the surface.

Building in Karst Terrain?

The KYTC and FHWA have a great deal of experience constructing roadways in karst terrain. Best management practices will be employed to ensure that impacts to karst, groundwater and animal life are avoided, minimized and/or mitigated.

Stream Assessment Scope and Sampling Methodology

The stream assessment work included collection of fish, macroinvertebrates and water quality samples in accordance with KYTC standard procedures. Detailed stream assessment data for each site is also presented on KDOW’s “High Gradient Field Data Sheets.” Representative surface streams were selected for assessment and sampling based on their status as blueline streams on United States Geological Survey (USGS) 7.5 minute topographic quadrangle maps, and confirmed in the field as either ephemeral (short lived), intermittent or perennially flowing features. Based on USGS map review, 43 USGS blueline stream features occur in the project study area. Physical and biological surveys were conducted for the USGS-designated surface streams occurring within the project Bands B, D, KY 80, G, H and I; however, during field studies conducted from July to September 2003, stream conditions ranged from no flow/completely dry to strong flow, indicating the presence of ephemeral, intermittent and perennial conditions.

A total of 59 stream sites on 43 USGS blueline streams were surveyed (several features sampled multiple times due to parallel orientation to the project). These surveys consisted of detailed physical, water quality and biotic (fish and benthic) surveys at 25 stream sites, and only physical habitat surveys at the remaining 34 stream sites (no water quality or biotic surveys conducted due to limited available habitat and lack of surface water at these locations). Locations of stream survey sites are shown on figure 4.2.6-1 in Appendix C.

Summary of Rare and Endangered Aquatic Species Sampling

The following species were surveyed for during the aquatic sampling for the I-66 project:

- *Phoxinusumberlandensis* (blackside dace) – None Recovered
- *Notropis* species 4 (sawfin shiner) – None Recovered
- *Percina squamata* (olive darter) – None Recovered
- *Ichthyomyzon greeleyi* (mountain brook lamprey) – None Recovered
- *Etheostoma cinereum* (ashy darter) – A single individual of this species was recovered from Site #43 (Rockcastle River). The species is

known to be locally common in this area from both Rockcastle and Laurel Counties (Burr and Warren 1986).

- *Phenacobius uranops* (stargazing minnow) – None Recovered
- *Leptoxis praerosa* (onyx rocksnail) – None Recovered
- *Pleurocera curta* (shortspire hornsnail) – None Recovered

These species were surveyed for during the stream assessment portion of the I-66 field investigations. For species descriptions and a comprehensive list of all the species surveyed for the project, refer to section 4.2.12

No federal or KSNPC listed freshwater mussels were collected during fish or macroinvertebrate sampling. Freshwater mussels were sampled during a specific mussel survey. See Section 4.2.12 for discussion on mussel sampling.

Physical Conditions of Streams

Channel, riparian and other physical conditions noted at the 56 stream sample site locations (43 different USGS blueline features) during field surveys conducted for this study are summarized in table 4.2.6-1 in Appendix C.

Secondary Source Information for Surface Streams

Secondary source information for streams in the project area was reviewed to gain a historical perspective and to serve as a reference for findings of the surveys conducted for this project. The source reviewed included: 1) KDOW’s 1996, 1998 and 2002, Kentucky 305(b) and the 1998 and 2002, 303(d) Reports as well as information from the 1992 “Kentucky Rivers Assessment.”, 2) USFS report entitled “Daniel Boone National Forest Proposed Revised Land and Resource Management Plan and Draft Environmental Impact Statement” (USFS April 2003), 3) USFS Aquatic Resource Assessment Team study entitled, “An Assessment and Strategy for Conservation of Aquatic Resources on the DBNF” (Dolluff et al. April 2001), 4) KSNPC (1994) study of mussels in the Rockcastle River prepared for the USFS DBNF entitled “A Survey of the Unionids (Bivalvia: Unionidae) of the Rockcastle River, Billows, Kentucky to the Cumberland River.”, 5) 1982 USFS Northeast Forest Experiment Station study entitled “Stream Water Quality in the

Coal Region of Eastern Kentucky” (Dyer 1982),. 6) KSNPC (June 1980) report entitled “Aquatic Biota and Water Quality Survey of the Upper Cumberland River Basin.”, 7) KDFWR assessments in 1969 and reported in a Kentucky Fisheries Bulletin Number 52 entitled “Inventory and Classification of Streams in the Upper Cumberland River Drainage” (KDFWR 1969).

Aquatic Resources with Special Stream Status

Rockcastle River
The Rockcastle River has also been designated as an Outstanding State Resource Water (OSRW), and an Exceptional Water (EXCW) resource. The Rockcastle River is a cold-water aquatic habitat (CWA) known to harbor several rare fish, including the federal Species of Management Concern ashy darter, which was identified from a survey of the Rockcastle River. The Rockcastle River section (River Mile 24.4 to River Mile 8.5) from the KY 80 bridge to the backwaters of Lake Cumberland has been designated as a state Wild River, (see Figure 4.2.7-1 in Appendix C) and has been nominated as a national Wild and Scenic River. Due to its eligibility to attain national status, this river would be considered a Section 4(f) impact. Aquatic and faunal impacts to the Rockcastle River are discussed in Chapter 5.2.29.

Sinking Creek
Sinking Creek begins in the western end of the Project Corridor as a first order stream, and grows to fourth order, before flowing outside the project corridor. Sinking Creek remains a fourth order stream until eventually flowing into the Rockcastle River south of the project area. It occurs partially within the DBNF in Laurel County and is an OSRW. Previous mussel surveys confirmed the presence of the federally endangered mussels, Cumberland bean and Cumberland elktoe mussels (Groves and Schuster 2000) in Sinking Creek occurring at a site from Willie Green Road to Carmichael Road, directly downstream from Alternative I. That reach has been designated by the USFWS as “Critical Habitat” for the Cumberland elktoe mussel. Critical Habitat are “specific geographic regions, whether occupied by a listed species or not, that are essential for its conservation and that have been formally designated by rule”

Buck Creek
Buck Creek is an exceptional stream with abundant karst features and clifflines. It provides habitat for a

diversity of wildlife and has the largest concentration of T&E species records within the Northern Corridor. From River Mile (RM) 62.6 to RM 28.9, Buck Creek is listed as an EXCW, a Reference Reach Stream (R_RCH), and an OSRW. From RM 53.3 to RM 10.5, Buck Creek is an OSRW. All of Buck Creek within the project area has been designated by the USFWS as Critical Habitat for the federally endangered Oyster mussel and the Cumberlandian combshell mussel.

The project has been coordinated with the US Fish and Wildlife Service (USFWS), the Kentucky Department of Fish and Wildlife Resources (KDFWR), the Kentucky State Nature Preserves Commission (KSNPC), and the Kentucky Division of Water (KDOW). Coordination efforts were undertaken to ensure that the project considered the special status of these water resources and implemented efforts to avoid and/or minimize impacts to these resources.

Detailed descriptions of the aquatic resources and associated impacts are presented in chapter 5.2.23.

4.2.8 Wetlands

Survey Methodology and Wetland Classification

Wetland surveys were conducted in accordance with Executive Order 11990, U.S. Army Corps of Engineers (USACE) protocols, Kentucky Transportation Cabinet (KYTC) guidelines, and U.S. Department of Transportation Federal Highway Administration (FHWA) guidelines. Wetlands were identified and delineated in the study area through the use of the following: mapping, soil surveys, aerial photography, 1987 Corps of Engineers Manual, plant lists, hydric soils lists, field surveys and agency coordination.

Detailed field investigations were conducted from July 2003 through July 2004. During field investigations, wetland determinations and delineations were conducted in accordance with the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Ponds were identified in the study area through the use of existing GIS mapping and confirmed in the field during the investigations. Mapped ponds dominated by hydrophytic vegetation were delineated and classified as wetlands. Based in Criteria set forth by the USACE, a jurisdictional opinion was made by field personnel for each of the wetlands and ponds identified within the study bands.

Wetlands and ponds possessing a surface water connection to a Water of the U.S. were jurisdictional. Isolated wetlands (those without a direct surface water connection to a Water of the U.S.) were included on project mapping and identified as nonjurisdictional. Wetlands located entirely within a man-made stormwater or roadside drainage ditch and possessing no groundwater influence were considered non-jurisdictional. Stormwater basins, man-made farm ponds and natural ponds lacking a surface water connection were also non-jurisdictional. Streams were identified and delineated in the study area through the use of existing GIS mapping and detailed field study investigations. Unmapped streams were mapped in the field using GPS. The flow regime of each mapped and unmapped waterway was characterized based upon field indicators, and was described as being perennial, intermittent, or ephemeral. Due to the karst nature of the project area in Pulaski County, some streams lack an identifiable surface water connection to the Waters of the United States because they empty into, or emerge from a karst feature, such as a swallet or sinkhole. In such cases, wetland field personnel used Best Professional Judgment to determine whether or not the stream or wetland in question qualified as a jurisdictional body of water. The USACE has the final judgment concerning the jurisdictional determination for all waters within the project area.

Acreages, obtained through the use of NWI mapping and field delineations, were calculated using ESRI's ArcMap. Acreages obtained were applied to a weighted system based on the Cowardin classification (Cowardin et al. 1979) of each wetland. This system was used to determine the amount of impacts to the wetlands identified along the project alternatives. A weighted system is used because wetland types have different functions and values. Wetland functions include flood control, groundwater recharge, sediment retention/stabilization, nutrient cycling, natural reservoirs, water filters, climate change mitigation, and reservoirs of biodiversity (Ramsar Convention on Wetlands 2001). Values associated with wetlands, include providing sites for hunting and fishing, photography, birding, outdoor classrooms or environmental education, and the enjoyment of open spaces⁸. Specific wetland impacts are discussed in chapter 5.2.32 of this document with additional detail

⁸ <http://www.nrcs.usda.gov/programs/farmbill/1996/FuncFact.html>

provided in the Terrestrial and Aquatic Baseline Report (February 2005).

4.2.9 Karst and Geohazards Survey

Karst Study and Methodology

The purpose of this study was to inventory karst features and geohazards found within the project's study bands. Karst and geohazard field work was performed from November 2003 through August 2004. Qualified project field staff completed field assessment activities related to karst features, geohazards, and karst fauna. An independent dye tracing study by the KGS was conducted to assess karst hydrogeology (see 4.2.5). The karst feature field inventory was performed within Band KY-80, Band B, and Band D because those bands are largely underlain by carbonate rock strata. Detailed karst fauna investigations were conducted to inventory cave vertebrates and invertebrates, which included field visits to sixty-three (63) caves.

There are few specific standards for performing a karst geological assessment for National Environmental Protection Act (NEPA) documentation. The work scope for this study was based on best practice methods, previous NEPA experience, guidance from USEPA's "Ground-water Monitoring in Karst Terrains" (March 1989), procedures detailed in "Karst Inventory Standards and Vulnerability Assessment Procedures for British Columbia" (Ministry of Forests Research Branch January 2003), and suggested approaches by 'industry experts' (see Karst and Geohazards report for extensive list of references utilized in the karst evaluation).

An inventory was performed of the karst features and other geologic resources and geohazards within the I-66 Study Band; specifically within the Bands recommended by the Citizens Committee outlined in chapter 3.2.1. This baseline inventory was used to characterize the impacts for each highway alignment alternative. The karst investigation approach provides impact information in three areas:

- Geologic Resources and Geohazards (karst terrain features, landslides, and mining and mineral resource issues)
- Hydrogeology (groundwater impacts)
- Karst Fauna (impacts to cave dwelling plants and animals).

Karst Feature Inventory

The geology and physiography in the study areas results in a variety of potential environmental consequences. The geologic formations are being exploited for groundwater use, production of fossil fuels, and development of surface and underground industrial mineral mines. The weathering of geologic strata have resulted in the formation of slide-prone soils and extensive development of karst topography.

The study area contains active, abandoned, and prospective mine operations, which have the potential increase land value in some areas (permitted mines) and diminish property values in others (mine spoil areas). These operations have the potential to affect all the bands. The inventory of the karst terrain and hydrogeology features was based on information obtained through the literature review and the field reconnaissance.

A total of 1129 karst features were identified within the western project termini and the eastern outcrop of the carbonate rock units. Virtually all of the karst terrain features were located in Pulaski County. Of the 1129 features inventoried, sinkholes represented about 45% (see figure 4.2.9-1 for an example of a project area sinkhole), and closed depressions represent an additional 20%. Several areas exhibited closely spaced sinkholes that were designated as complex sinkholes; these were 10% of the features. As the dominant feature, sinkhole area and depths were evaluated to establish the arithmetic mean of the samples. The 'average' sinkhole dimension is 16 feet wide, 23 feet long and 4 feet deep. The average dimensions of the closed depression were 71 feet wide, 96 feet long and 5 feet deep. Caves, springs, swallets, sunken valleys, and area of epikarst were also observed. Karst features and associated impacts are detailed in chapter 5.2.6.

Karst Hydrogeology

A discussion of the karst hydrogeology in the project area is discussed in section 4.2.3. The KGS conducted dye tracing studies from November 2004 through May 2005 to evaluate the hydrology of the project area that is underlain with karst. The scope of that study is discussed in 4.2.5.

4.2.10 Karst Fauna

Karst Faunal Survey Methodology

The primary sampling area for this project lies in the general vicinity where KY 80 intersects the karst associated with the edge of the Cumberland Plateau. A list of over 50 caves, springs and karst features was supplied by the Kentucky Speleological Survey (KSS) and was used as the starting point for the fieldwork. In general, sites in or directly adjacent to the alternate bands were visited and sampled for fauna. However, the entire recharge area of the Sinking Valley Cave System was considered since the many caves comprising this large system are hydrologically connected and share fauna (Currans and Ray 1998; Romanik 1986).

Thus, several caves to the north of the main project area were sampled to provide a clearer picture of the fauna present in the Sinking Valley Cave System.

In the Sinking Valley Cave System, caves were visited in the northern part of the recharge area (e.g., Gilmore, Baker, Hog, Hog Annex, Double and Redbud caves) as well as in the Kentucky 80 vicinity (e.g., Price Cave, Boiling Pot, Short Creek and Stab caves). Some sites were also sampled in the associated Burdine Valley (e.g., Burdine School #2, Blackhawk caves). Other major sites visited in the area included the Cedar Creek Cave System (including Cedar Creek and Cedar Creek Spring caves) and a cluster of sites in the area of the sink of Flat Lick Creek (including Blowing Cave). Numerous other caves not associated with any of these assemblages or systems included Sheep Cave, Osborne Cave, Cedar Gap Cave, Odell's Pit and Stykes Cave.



Figure 4.2.9-1 – Karst Terrain – Sinkhole in I-66 Project Area

Field work was performed from 21 November 2003 to 25 July 2004. In addition to walking much of the karst in the project area, a reconnaissance was made by canoe through the part of Buck Creek traversed by the project area. The entire project area was also analyzed from the air on two occasions. Hand sampling was conducted in all sites visited. Sampling methods included: pitfall traps, Karaman-Chappuis extraction of stream gravel, plankton netting of drip pools and Berlese extraction of leaf litter. Pitfall traps were placed and then retrieved after an intervening period of two to three weeks. Other sampling included Karaman- Chappuis extraction of stream gravel, plankton netting of drip pools, and Berlese extraction of leaf litter.

Karst Fauna Identification

The results of visits to 63 sites are listed in this document, primarily caves, as well as springs and swallets. A total of 114 taxa (scientifically classified groups or categories) were found during sampling in caves of the project area. This was a taxonomically diverse assemblage divided among 4 phyla, 11 classes, 27 orders, 55 families and 90 genera. At 37 localities obligate subterranean animals were sampled. Of the 114 taxa listed herein, 34 were judged to be ecologically classified as obligate subterranean organisms (trogllobites/stygobites), and 37 were assigned global ranks of significant rarity: G1-13 species, G2 – 11 species, G3 – 13 species. Of the 34 obligate subterranean species, 28 were found in caves associated with the Sinking Valley Cave System. Culver and Sket (2000) evaluated the major subterranean systems of the world and concluded that any cave system with 20 or more obligate (able to exist in a particular environment) subterranean species was of global significance, identifying only three such sites in the United States. From a karst biological standpoint the Sinking Valley Cave System is an ecologically important resource.

Buck Creek is apparently a local zoogeographic divide with evidence that some elements of the fauna are different on the east and west sides of the stream. Different species of the milliped, *Pseudotremia* occur in the caves on the opposite sides of the creek, and the pseudoscorpion, *Kleptochthonius*, undescribed species, and pselaphid beetle, *Batrisodes* (Batriasymmodes), undescribed species, were found only in caves on the west side. Although no

large system like the Sinking Valley Cave System is found in the project area on the west side of Buck Creek, four biologically significant caves were found there (with number of trogllobites/stygobites): (1) Blowing Cave–9, (2) Cedar Creek Cave System–13 (Cedar Creek Cave and Cedar Creek Spring Cave, (3) Stykes Cave–15 and (4) Odell’s Pit–14. Of these, the Cedar Creek Cave System is of note since it lies adjacent to a possible interchange.

Any site with a globally rare species (G1, G2 or G3) is of particular significance. Of the 63 sites visited, 29 produced one or more globally rare species.

Karst faunal records and project associated impacts are discussed in chapter 5.2.16.

4.2.11 Terrestrial Habitats and Wildlife

Terrestrial Habitat Survey Methodology

The project alternatives were walked and visually and aurally surveyed for floral and faunal species and ecological communities by teams of three to five crew members concurrent with wetland surveys. Surveys were conducted throughout the year. During these surveys the locations of caves, rock shelters, sink holes and other karst features were recorded. Habitats were delineated and included in project mapping. Potential endangered and rare bat habitats were recorded and surveyed for bats following the Indiana Bat Recovery Program guidelines (USFWS 1983), where appropriate.

Vegetative Communities

Vegetation was documented throughout the entire growing season. Specific habitats, such as upland fields/pastures, upland forests, riparian areas, bottomland forests, bottomland fields/pastures, abandoned strip mines and wetlands were identified and recorded. These habitats were designated into one of the following categories based in part on a Braun-based community classification of Palmer-Ball et al. (1988): Dry Evergreen Forests, Dry to Moist Deciduous Oak Forests, Moist (Mesophytic) Forests, Seasonally Wet Forests, Forests by Watercourses and Seeps, Rocky Banks of Rivers and Major Creeks, Herbaceous Rangelands, Shrublands, Mixed Rangelands, Croplands and Pasture. A detailed description of the individual plant communities is contained in the Terrestrial and Aquatic Baseline Survey Report (KYTC February

2005). Plant species that were not field-identified were collected, pressed, and identified in the lab using a binocular dissecting scope, dichotomous plant keys, and floral references as necessary to aid in identification. References used included Gleason and Cronquist (1991), Strausbaugh and Core (1978), Wharton and Barbour (1971, 1973), Beal and Thieret (1986), Britton and Brown (1970), Cranfill (1980), Cronquist (1980), Godfrey and Wooten (1979, 1981), Hitchcock (1951), Holmgren (1998), and Steyermark (1963).

Project Fauna

Faunal investigations involved recording live species by direct aural and visual observation, searching for faunal evidence (tracks, scat, bedding places, skeletal remains in discarded bottles and cans, and road kills), turning over rocks and logs, and conducting pitfall trapping surveys and bat netting. A comprehensive summary of flora and fauna identified within the project area is presented in chapter 5.

4.2.12 Threatened, Endangered and Rare Species

The Endangered Species Act of 1973 (Amended 1988), provides a means, whereby ecosystems of Threatened and Endangered species may be conserved. Threatened species are those species that are in danger of extinction throughout all or a significant portion of its range. A Threatened species is any species likely to become endangered in the foreseeable future in all or a significant portion of its range. The USFWS is responsible for species listing and administering the Threatened and Endangered Species List. Section 7 of the Endangered Species Act directs Federal agencies to use their authorities to conserve listed species and, in consultation with USFWS, ensure that their actions do not jeopardize the continued existence of any listed species or destroy or adversely modify critical habitat.

Coordination with the USFWS, KSNPC, and subsequent literature searches indicated that 25 federally listed species have the potential to occur within the project area (USFWS correspondence 2001, updated 2006; KSNPC 2001, 2002, 2004; Campbell et al. 1994). (Coordination correspondence with USFWS and KSNPC is included in Appendix B). Eight of these are federally endangered, three are federally threatened, two are federal Candidates for listing, and twelve are species of management concern. Many of

these are also KSNPC listed and conservation species in the DBNF. Threatened, Endanger and rare species with the potential to occur within the project area, their habitat and survey efforts are listed here:

Federally Threatened and Endangered Species (Those With Endangered Species Act, Section 7 Protection)

Cumberland elktoe (*Alasmidonta atropurpurea*)
The Cumberland elktoe is both federally and KSNPC endangered. The only known population of this species in the Rockcastle River basin is known to occur in Sinking Creek, a portion of which (the mouth upstream to the confluence of Laurel Branch) has been designated as “critical habitat” for the Cumberland elktoe (KSNPC 2004). It inhabits cracks of bedrock ledges, cobble, sand, mud (Parmalee and Bogan 1998), and gravel substrates (USFWS 2003). This species is also known from shallow pool areas, known as flats, which lack the typical pool bottom contour development, have substrates of sand and scattered cobble/boulder material, are relatively shallow in depth, and have a very slow, almost indiscernible current (USFWS 2003). Sinking Creek was surveyed for this species, with special emphasis placed on its preferred habitats.

Oyster mussel (*Epioblasma capsaeformis*)
The oyster mussel is both federally and KSNPC endangered. It inhabits streams with moderate (USFWS 2003) to swift currents (Parmalee and Bogan 1998, USFWS 2003) in shallow riffles (Parmalee and Bogan 1998). Substrates are usually gravel/sand (Parmalee and Bogan 1998), boulder, or rarely mud substrates, and it may be found in water-willow (*Justicia americana*) beds (USFWS 2003). It has also been located in gravel pockets between bedrock ledges in areas where the current is swift. Although it may be buried below the substrate, females may be found atop the substrate while releasing glochidia (USFWS 2003). The oyster mussel may have been extirpated from the Rockcastle River and Buck Creek (KSNPC 2001 Early Coordination, USFWS 2003). A recent survey of Buck Creek by Hagman (2000) did not even produce relict (remaining piece of an otherwise extinct plant or animal in an environment that has greatly changed from that in which it began) shells of this species. A portion of Buck Creek, from KY 92 upstream to KY 328, within the project area has been designated by the USFWS as “critical habitat” for this species. The

Rockcastle River and Buck Creek were surveyed for this species, with special emphasis placed on its known preferred habitats.

Little-wing pearlymussel (*Pegias fabula*)
Both federal and KSNPC endangered, the little-wing pearlymussel, is found in clear, cold, high-gradient streams with sand, fine gravel, and cobble substrates (Parmalee and Bogan 1998). It is known from the lower and upper Cumberland River, below Cumberland Falls (Cicerello and Schuster 2003), and has the potential to occur within the project area. There are historical records for the little-wing pearly mussel in the Rockcastle River (Laurel County), Horse Lick Creek (Rockcastle County), Buck Creek, and Pitman Creek (Pulaski County) within the Cumberland River drainage (USFWS 1989). The above listed waterways that lie within the project area were surveyed for this species, with special emphasis placed on its known preferred habitats.

Cumberland bean (*Villosa trabalis*)
The Cumberland bean, or Cumberland bean pearly mussel, is both federally and KSNPC endangered. According to the KSNPC (2001), Sinking Creek contains the “world’s best remaining population” of the Cumberland bean. There are also records of this species from the Rockcastle River (USFWS 1984, KSNPC 2001 Early Coordination), Buck Creek in Pulaski County, and Horse Lick Creek, Roundstone Creek and the Middle Fork of the Rockcastle River in Rockcastle County (USFWS 1984).

The Cumberland bean is typically found in shallow riffles and shoal areas in medium sized streams with moderate gradient (USFWS 1984). Usually streams with populations of this species have a gravel or sand and gravel substrate (Parmalee and Bogan 1998), with a minimum of siltation (USFWS 1984). Those waterways listed above that occur within the project area (i.e., Sinking Creek and Buck Creek) were surveyed for this species, with special emphasis placed on its known preferred habitats.

Cumberlandian combshell (*Epioblasma brevidens*)
The Cumberlandian combshell (Figure 4.2.12-1 at right) is both federally and KSNPC endangered. It is found in clear, moderate-sized streams (Parmalee and Bogan 1998) on shoals and riffles, usually at depths below three feet (USFWS 2003). Preferred substrates are cobble, boulder (USFWS 2003), and sand/gravel

(Parmalee and Bogan 1998). The Cumberlandian combshell may have become extirpated (no longer exists in a particular location) from the Rockcastle River (KSNPC 2001 early coordination, USFWS 2003). Recent records indicate that small populations of the Cumberlandian combshell occur in Buck Creek within the project area (Hagman 2000, USFWS 2003). [A portion of Buck Creek, which includes the entire portion of Buck Creek within the project area, has been designated by the USFWS as “critical habitat” for this species.] The Rockcastle River and Buck Creek were surveyed for this species, with special emphasis placed on its known preferred habitats.

Blackside dace (*Phoxinus cumberlandensis*)
Habitat for this federal and KSNPC threatened species is typically small upland headwaters and creeks approximately five to 15 feet in width with riffle and pool areas about equal in extent and size. This species prefers stream sites with abundant riparian vegetation, canopy cover greater than 70%, cool water, and silt-free substrates. The species occurs in pools with cover such as bedrock, rubble, undercut banks and/or brush (KSNPC 2002). Efforts were made during aquatic field surveys to identify blackside dace habitat and to determine its presence through careful identification of collected individuals.

Bald eagle (*Haliaeetus leucocephalus*)
This species is both federally and KSNPC threatened. The bald eagle is known to nest along Laurel River Lake in Laurel County, which is approximately 4.5 mi (7.24 km) south of the southern-most alignment (Alternate I). Bald eagles generally forage on large lakes and rivers, and the known nesting population of bald eagles on Laurel River Lake forages from Laurel River Lake along the Cumberland River to Lake Cumberland (Personal communication with John Omer, USFS biologist, London Ranger District, Spring 2004). The bald eagle was searched for in the appropriate habitat during field surveys.

Red-cockaded woodpecker (*Picoides borealis*):
This species is federally endangered, KSNPC extirpated, and PIF (Partners In Flight) Extremely High Priority. It is listed as a Priority Bird species in the PIF Northern Cumberland Plateau area. While habitat for the red-cockaded woodpecker still exists within the project area, it is more rare since the ravaging attacks of the southern pine beetle (*Dendroctonus frontalis*) during the period from 1999-2001, in which more than

100,000 acres of pine forest (about 80%) was lost on the Daniel Boone National Forest⁹. The red-cockaded woodpecker excavates its nest cavities in live pines and pecks small holes around the cavity, which allow sap to form a sticky barrier against natural predators, such as snakes. With so much of its natural habitat destroyed, the future of the red-cockaded woodpecker in Kentucky became bleak. As a result, fifteen of the known red-cockaded woodpeckers that could be found within the Daniel Boone National Forest were captured and translocated by the USFS in 2001. The red-cockaded woodpecker is considered to be extirpated from Kentucky; therefore, is unlikely that this species occurs within the project area; however, biologists remained alert during field surveys within the appropriate habitat to the unlikely occurrence of red-cockaded woodpeckers.

Gray bat (*Myotis grisescens*)
The federal endangered and KSNPC threatened gray bat is known from the project area (KSNPC correspondence 2004). Gray bats use caves throughout the year for hibernation, both day and night roosts, and for maternity colonies (Bat Conservation International, Inc. 2001). Caves, mine portals and bridges within the project area were surveyed and netted for the gray bat. Streams, ponds and other foraging habitats were netted following the guidelines provided in the Indiana Bat Recovery Plan. During Phase 1A, several gray bats were outfitted radio transmitters. Tracking signals were searched for by slowly driving roads near the capture location with the radio receiver active and the antenna manually being pointed in various directions. When no signal could be received via this method, known caves and bridges thought to be potential roost sites were checked for a radio signal.

Indiana bat (*Myotis sodalis*)
The Indiana bat is both federal and KSNPC endangered. Records indicate that an Indiana bat was identified from Blowing Cave in Pulaski County in November, 1991 (Personal communication with Traci Wethington November 2004), and correspondence with KSNPC (2004) indicated that they have been identified from nearby areas. In the winter, Indiana bats hibernate in caves or mine portals that are capable of trapping and storing cold air. In the summer, reproductive females congregate in nursery colonies of 25 to 200 individuals beneath the sloughing bark of

large often dead trees, such as elm, cottonwood, green ash, oak, and shagbark hickory. In much of the range, maternity colonies are often located in open bottomland habitats that receive direct sun exposure for at least half of each day (Bat Conservation International, Inc. 2001), though in many highly topographic areas, including eastern Kentucky they often select maternity trees fairly high on south facing slopes which receive greater solar exposure and maintain higher temperatures than valleys (Kiser 2002). Caves, mine portals, bridges and potential roost trees within the project area were surveyed for the Indiana bat. Additionally, the Indiana Bat Recovery Plan guidelines were followed for netting across streams, ponds, roadcuts, roadways, and other potential bat foraging habitat and flight corridors.

State Listed, Rare and DBNF Conservation Species

Rockcastle aster (*Eurybia* [*Aster*] *saxicastellii*)
The Rockcastle aster is a federal Species of Management Concern and KSNPC threatened. It has been recorded from along the Rockcastle River growing, almost exclusively, “with tall herbs in thickets or open woods at transitions from grassy boulder-cobble bars to the adjacent slope forests, generally in areas with freshly deposited sand (Campbell et al. 1994).” The Rockcastle aster was searched for in appropriate habitats concurrent with other field and stream surveys.



Figure 4.2.12-1 – Cumberlandian Combshell – A Federally Endangered Mussel

⁹ <http://www.fs.fed.us/r8/boone/SPB.htm>

Butternut (*Juglans cinerea*)
Butternut, or white walnut, is a federal Species of Management Concern, KSNPC listed as Special Concern, and a conservation species in the DBNF. This species had declined in the state throughout the last century due to bark diseases (Campbell et al. 1994). It is usually found along mesic wooded ravines, and along streams (KSNPC correspondence 2004). Butternut was searched for in the appropriate habitats concurrent with wetland and bat surveys.

White fringeless orchid (*Platanthera integrilabia*)
The white fringeless orchid, a Candidate for federal listing, KSNPC endangered, and a conservation species in the DBNF, is found in moist or boggy streamheads, usually in open woods. It is known from the headwaters of Pine Creek (Campbell et al. 1994). Headwater areas within the project area were searched for the white fringeless orchid concurrent with wetland and bat surveys.

Virginia spiraea (*Spiraea virginiana*)
Virginia spiraea is a federally and KSNPC threatened vascular plant with occurrence records in all three counties within the project area. Historical records indicate that it is known from the Rockcastle River, and Sinking Creek in Laurel County (KSNPC correspondence 2004). It inhabits high gradient streams, especially gravel bar, meander scrolls, and natural levees, and thrives best in floodprone areas with sufficient scour to minimize competition from woody plants (USFWS 1992). Biologists familiarized themselves with the plant’s habit and vegetative characteristics, and studied samples of Virginia Spiraea at the KSNPC. The appropriate habitats described in the Virginia Spiraea (*Spiraea virginiana* Britton) Recovery Plan (USFWS 1992) along the Rockcastle River and Sinking Creek were searched for Virginia spiraea during its flowering season.

Northern white cedar (*Thuja occidentalis*)
Northern white cedar is a federal Species of Management Concern and KSNPC threatened. It is found in seepage areas, limestone cliffs, streambanks, and lowland swamps (BWCA 1999). The appropriate habitats were searched for northern white cedar concurrent with wetland and bat surveys.

Shortspire hornsnail (*Pleurocera curta*)
The shortspire hornsnail is a federal Species of Management Concern, a KSNPC Species of Concern, and a conservation species in the DBNF (USFWS 2004).

Habitat for this species has not been well documented. The species may occur in larger river basins in unpolluted, relatively clear reaches in association with submerged aquatic macrophytes (Benz and Collins 1998). Efforts were made during aquatic field surveys to identify shortspire hornsnail habitat and to determine its presence through careful identification of collected individuals.

Cumberland papershell (*Anodontoides denigratus*)
The Cumberland papershell is a federal Species of Management Concern, KSNPC endangered, and a conservation species in the DBNF. It is known from lower Sinking Creek in Laurel County in silt, mud or sand substrates (KSNPC coordination 2004). This species was searched for in the appropriate habitat during mussel surveys.

Snuffbox (*Epioblasma triquetra*)
This mussel is a federal Species of Management Concern, KSNPC endangered, and a conservation species in the DBNF. Snuffbox habitat is medium-sized streams to large rivers, generally in mud, rock, gravel or sand substrates (KSNPC correspondence 2004). This species was searched for in the appropriate habitat during mussel surveys.

Tennessee clubshell (*Pleurobema oviforme*)
The Tennessee clubshell a federal Species of Management Concern, KSNPC endangered, and a conservation species in the DBNF. It inhabits small headwater streams and large rivers with sand/gravel and, occasionally mud substrates (KSNPC coordination 2004). This species was searched for in the appropriate habitat during mussel surveys.

Fluted kidneyshell (*Ptychobranhus subtentum*)
The fluted kidneyshell is a federal Candidate for listing, KSNPC endangered, and a conservation species in the DBNF. This species is found in small streams and rivers with moderate to swift current. Its microhabitat is typically clean swept rubble, gravel and sand substrates in shallow riffles and shoals (KSNPC 2002). Fluted kidneyshell was searched for in appropriate habitats during the mussel survey.

Purple lilliput (*Toxolasma lividus*)
The purple lilliput is a federal Species of Management Concern, KSNPC endangered, and a conservation species in the DBNF. Its habitat is small to medium-sized streams in sand, fine gravel or mud substrates in shallow water. Historically, it is known from Buck

Creek in Pulaski County (KSNPC correspondence 2004). This species was searched for in the appropriate habitat during mussel surveys.

Ashy darter (*Etheostoma cinereum*)
The ashy darter is a federal Species of Management Concern, a KSNPC species of special concern, and a conservation species in the DBNF. Ashy darter habitat is medium-sized rivers with slow to moderate current, usually associated with cover, such as boulders, snags, and detritus.

Historical records indicate that it occurs in Buck Creek in Pulaski County and the Rockcastle River along the Pulaski/Laurel County line (KSNPC correspondence 2004). This species was searched for in the appropriate habitat during aquatic surveys

Olive darter (*Percina squamata*)
This species is a federal Species of Management Concern, KSNPC endangered, and a conservation species in the DBNF. The olive darter is recorded from the Rockcastle River (KSNPC correspondence 2004). Its habitat is upland streams and rivers in riffles with boulder, cobble and pebble substrates (Burr and Warren 1986). This species was searched for in the appropriate habitat during aquatic surveys.

Sawfin shiner (*Notropis* species 4)
The sawfin shiner is KSNPC endangered. According to Kentucky's Comprehensive Wildlife Conservation Strategy (2005), in Kentucky, this species is known only from the Big South Fork Cumberland River (Rock Creek), McCreary County; Pitman Creek, Pulaski County; and Little South Fork Cumberland River, Wayne County (Burr and Warren 1986). The sawfin shiner inhabits cool, clear upland streams on the eastern edge of the highland rim and Cumberland Plateau (Burr and Warren). Within these streams, it can be found in quiet or gently flowing pools, backwaters, or moderate runs over clean gravel and rubble as well as somewhat silted substrates. Historical records indicate that the sawfin shiner occurs in Pitman Creek in Pulaski County (KSNPC correspondence 2004). This stream was not sampled for fish during the aquatic surveys because it does not occur within the project area; however the sawfin shiner was searched for in the appropriate habitat during aquatic surveys.

Mountain brook lamprey (*Ichthyomyzon greeleyi*)
The mountain brook lamprey is KSNPC threatened. According to Kentucky's Comprehensive Wildlife

Conservation Strategy (2005), this species is currently known to occur in the Rockcastle River, Big South Fork of the Cumberland River, and upper Green River. Historically, it is known from Sinking Creek in Laurel County (KSNPC correspondence 2004). Like other lampreys, the life cycle consists of a larval and adult stage. Larvae may spend live five to seven years before transforming into adults. The ammocoetes live in low gradient areas of these streams in sand, mud and organic debris. Upon adult transformation, spawning occurs during late spring on riffles in slow to moderate current in upland creeks and rivers. Adults are available for capture only during a brief period in spring. This species was searched for in appropriate habitat during stream surveys.

Stargazing minnow (*Phenacobius uranops*)
The stargazing minnow is KSNPC special concern. According to Kentucky's Comprehensive Wildlife Conservation Strategy (2005), the species is occasional and locally common in the upper Green and Barren River drainages; and sporadic and rare (possibly extirpated) in the Cumberland River drainage (Burr and Warren 1986). It is known historically from the Rockcastle River (KSNPC coordination 2004). It inhabits streams of moderate to high gradient in swift clear riffles and runs over clean gravel and pebble substrates. This species was searched for in appropriate habitat during stream surveys.

Onyx rocksnail (*Leptoxis praerosa*)
The onyx rocksnail is KSNPC special concern. This species has been found on algae-covered rocks in strong current, mainly in larger rivers (Bogan and Parmalee 1983). It is known from this type of habitat at a site which is no longer extant in the Rockcastle River. Historical records indicate that it occurred in Pine Creek in Laurel County (KSNPC correspondence 2004). It was formerly widespread in the Ohio, Tennessee, Cumberland, and Duck Rivers and their tributaries. The onyx rocksnail was searched for in the appropriate habitat during aquatic surveys.

Rafinesque’s big-eared bat (*Corynorhinus rafinesquii*)

This bat (see Figure 4.2.12-2 at right) is a federal Species of Management Concern, KSNPC Special Concern, and a conservation species in the DBNF. In Kentucky during the winter the Rafinesque’s big-eared bat hibernates in caves, abandoned mines and wells. During the summer, they roost in unoccupied buildings, barns, large tree hollows, rock shelters, and cave entrances (Bat Conservation International, Inc. 2001). This species was searched for in the appropriate habitat during bat netting surveys. Additionally, the Indiana Bat Recovery Plan guidelines were followed for netting across potential bat foraging habitat and flight corridors.

Eastern small-footed bat (*Myotis leibii*)

This species is a federal Species of Management Concern, KSNPC threatened, and a conservation species in the DBNF. The eastern small-footed bat inhabits a variety of habitats, including caves, mines, protected areas along cliffhills, abandoned buildings, and under rocks on the ground or on the floor of caves (KSNPC correspondence 2004). This species was searched for in the appropriate habitat during bat netting surveys. Additionally, the Indiana Bat Recovery Plan guidelines were followed for netting across streams, ponds, roadways, and other potential bat foraging corridors.

The I-66 Ecological study surveyed for the presence of Federally Threatened and Endangered Species, state listed species, and DBNF conservation species. In addition to the survey for species presence, the field studies investigated the potential for species habitat. Detailed survey information and potential impacts to the listed species and associated habitat are discussed in chapter 5.2.48.



Figure 4.2.12-2 – Rafinesque’s Big-Eared Bat – A Federal Species of Management Concern

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4.2.13 Farmland

Farmland Protection Policy Act

The Farmland Protection Policy Act requires identification of proposed actions that would affect land classified as prime and unique farmland. The U.S. Natural Resources Conservation Service (NRCS) administers this act to preserve farmland.

In accordance with 7CFR, Part 658 of the National Farmland Protection Policy Act, Land Evaluation criteria and Site Assessment criteria (LESA form AD-1006) were applied to determine effects to farmland within the project area. Factors are assigned values by the NRCS and the project investigator with scoring relative to its importance. Sites that receive a total site assessment score of 160 points or less are given a minimal level of consideration for protection. The Farmland Protection Act recommends higher protection for alternatives with scores of 160 or higher, and requires agencies to consider uses of land that is not farmland (e.g., residential or industrial areas), which would have lower LESA scores unless there are other overriding considerations¹⁰.

Farmland in Project Area

The majority of land within the project corridor in Pulaski County is rural agricultural. The U.S. Agricultural Census reported that Pulaski County had 1,977 farms totaling 232,129 acres of farmland. The main crops are corn (ranked 36th in production out of 120 counties in Kentucky), soybeans (39th), hay (2nd) and burley tobacco (15th). Cattle and hogs form the majority of livestock farming. Beef cattle were ranked 3rd in statewide production.

The agricultural land use in Laurel County is typically situated on the outskirts of the project area and occupies the majority of land use in the unincorporated portions of Laurel County. The U.S. Agricultural Census reported that Laurel County had 1,137 farms totaling 107,582 acres of farmland. The main crops are hay (ranked 33rd statewide), burley tobacco (52nd), alfalfa (56th) and corn (85th). Cattle forms the majority of livestock farming and is ranked 39th statewide.

Impacts to farmland and Farmland Conversion Impact Ratings are discussed in Chapter 5.2.58.

4.2.14 Parks and Recreational Facilities

Parks and recreational facilities occurring in the project area were identified through mapping, secondary source review and field surveys. Additional information regarding park facilities was obtained from local municipalities. The existing resources in the project area include: Shopville Community Park, Rockcastle River (State Listed Wild River, Proposed National Wild and Scenic River), Levi Jackson State Park, Daniel Boone National Forest, Laurel County Park and the Shelton Trace National Recreation Trail.

Public Park and Recreation Area Protection

Section 4(f) of the Department of Transportation Act (1966) as codified in USC Title 49 section 303 states that: It is the policy of the United States Government that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites and that The Secretary may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation areas or wildlife and waterfowl refuge, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, recreation areas refuge, or site) only if:

- (1) There is no prudent and feasible alternative to using that land; and
- (2) The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuges or historic site resulting from the use.

Section 6(f) of the Land and Water Conservation Fund (LWCF) requires that all LWCF funded property be replaced with property of similar use and in reasonable proximity to the impacted property. The National Park Service (NPS) will consider conversion requests if all practical alternatives to the proposed conversion have been evaluated, if fair market values (appraisals) of the affected property and its identified replacement property have been conducted, and if the proposed replacement property is of reasonable equivalent usefulness and location.

The proposed project has the potential to impact the Rockcastle River and the Shelton Trace National Recreation Trail under Section 4(f). It was determined that the Shopville Community Park has received LWCF funds and project associated impacts would require Section 6(f) coordination. Project impacts and Section 4(f) determinations for the Rockcastle River and the Shelton Trace National Recreation Trail as well as Section 6(f) impacts for the Shopville Community Park are included in chapter 6.2.1 of this document.

4.2.15 Hazardous Materials

An overview of potential hazardous materials sites was prepared for Phase 1A of the proposed project and covered both the northern corridor and the southern corridor. As discussed in chapter 3 the northern corridor was selected as the preferred corridor and study bands and alternatives were developed within this corridor. Phase 1B hazardous materials studies consisted of more in depth surveys within the focused study area. Phase 1B surveys provide alternatives-specific information on sites that have the potential to possess recognized environmental conditions (RECs). The American Society of Testing and Materials (ASTM) Standard E-1527 definition of REC is “the presence of hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of future release of any hazardous substance or petroleum product into structures on the property, ground, groundwater or surface waters of the property.

A search of federal, state and local environmental databases including the National Priority List (NPL), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), CERCLIS No Further Remedial Action Planned (CERC-NFRAP), Corrective Action Report (CORRACTS), Resource Conservation and Recovery Act Information System (RCRAInfo), Emergency Response Notification System (ERNS), State Leads List (SHWS), Solid Waste Facilities List (SWF/LF), Underground Storage Tank Database (UST) and additional federal and resource agency secondary source information. In addition to database review, field surveys of sites within the project area were conducted.

Hazardous Site Types Not Found in Project Area

The following types of sites were not identified within the project right-of-way: National Priorities List; Proposed National Priorities List; Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); CERCLIS No Further Remediation Action Plan; RCRIS Large Quantity Generator List; ERNS list (Emergency Response Notification System); State Hazardous Waste Sites; State Landfill Sites; CONSENT List (Superfund Consent Decrees); ROD List (Records of Decision); HMIRS List (Hazardous Materials Information Reporting System); MLTS List (Material Licensing Tracking System); PADS List (PCB Activity Database System); RATTs List (RCRA Administrative Action Tracking System); TRIS List (Toxic Chemical Release Inventory System); TSCA List (Toxic Substances Control Act).

Sites with the Potential for Hazardous Materials

Detailed studies within the proposed alternative rights-of-way resulted in 23 sites being identified as having the potential for the presence of recognized environmental conditions (RECs). All eleven proposed alternatives had sites that were investigated for the presence of RECs. After careful research and consideration of each site’s individual characteristics, several of these sites have been recommended for additional work, should a build alternative be selected as the Preferred Alternative. There are nine alternatives that impact sites recommended for additional work. Two proposed alternatives, D and I, do not impact any sites recommended for further study. For a detailed discussion of individual sites and alternative impacts, refer to chapter 5.2.60.

The level of hazardous materials study contained in the DEIS is referred to as a Phase I Site Assessment study and is intended to be used by the Kentucky Transportation Cabinet (KYTC) for assessing costs associated with the acquisition of new, potentially contaminated right-of-way for the project and the potential future costs and liabilities, which might accrue to the Commonwealth as owner.

¹⁰ <http://www.nrcs.usda.gov/programs/fppa/>

4.2.16 Air Quality

Air Quality Regions and Conformity

The project area is part of the Appalachian Intrastate Air Quality Control Region and the South Central Kentucky Intrastate Air Quality Control Region. The project area is not located within a Metropolitan Planning Organization (MPO) jurisdiction and therefore inclusion in air quality conformity analyses occurs only in the Statewide Transportation Improvement Plan (STIP). The proposed project is located on page 320 of the conforming state transportation improvement program (Kentucky Statewide Transportation Improvement Program (STIP), Fiscal Years 2001-2006; Kentucky Transportation Cabinet) approved October 2000 and in amendment 2004.109 of the Fiscal Years 2005-2007 STIP approved March 2005. For Pulaski, Laurel and Rockcastle counties transportation control measures are not required pursuant to the Amended Final Conformity Guidelines, September 15, 1997.

Project Area Air Quality

Pulaski, Laurel and Rockcastle counties do not have non-attainment designations for any of the EPA criteria air pollutants, which include: Carbon Monoxide (CO), Nitrogen Dioxide (NO₂), One-Hour and Eight-Hour Ozone (O₃), Sulfur Dioxide (SO₂), Particulate Matter (<2.5 micrometers (um) and <10um in size) and Lead (Pb). Criteria pollutants, other than CO, are not modeled on a project level basis but are included in overall air quality analyses, preformed by airshed. Transportation project related Carbon Monoxide is generated from the incomplete burning of fuel in automotive engines. The effects of CO are localized and attributable to tailpipe emissions, intensified by vehicles lining up at traffic signals. The future build and no-build CO levels are modeled using the CAL3QHC computerized dispersion model developed for the United States Environmental Protection Agency and the EPA MOBILE 6.2 model for the calculation of emission factors. Project specific model parameters for emission factors were provided by the KYTC Division of Environmental Analysis with the remainder run utilizing default values. The results of the project level CO analyses are included in chapter 5.2.61. For additional detail on the project air quality analysis, reference the Air Quality Baseline Report (November 2004).

4.2.17 Highway Traffic Noise

Highway traffic noise was modeled to determine future noise levels within the project area. Properties adjacent to the proposed alternatives were identified as noise sensitive receivers and existing noise levels were recorded using a sound level meter. The noise level at these receivers was then predicted for the build and no-build alternatives utilizing the FHWA Traffic Noise Model Version 2.5 (TNM 2.5) computer prediction model. USDOT’s Title 23 Code of Federal Regulations (CFR) Part 772 establishes design noise level/land use relationships and sets Noise Abatement Criteria (NAC) that are used to determine when a receiver has a noise impact due to the project. The land use types and associated NAC are shown in table 4.2.17-1. A receiver is determined impacted if the predicted noise level approaches (within 1 dBA Leq) or exceeds the NAC for its land use type. A receiver is also determined to be impacted by the project if the predicted future noise level is greater than or equal to 10 dBA Leq above existing noise levels.

Existing noise levels were recorded at 72 receiver sites. The 72 sites currently have existing measure noise levels ranging from 32.1 to 69.0 dBA Leq. The design year (2030) No-Build adjusted noise levels are predicted to range from 35 to 75 dBA Leq, and the design year (2030) Build adjusted levels are predicted to range from 35 to 80 dBA Leq. A detailed discussion of noise impacts by alternative is located in chapter 5.2.63. Figure 4.2.17-2 in Appendix C shows the locations of the modeled noise receivers.

As a general reference for translating noise levels into real world sounds, figure 4.2.17-1, at right, shows the dB level associated with some common outdoor and indoor noise levels.

For additional detail on methodology and computer modeling, refer to the Highway Traffic Noise Impact Analysis Baseline Report (January 2005).

Table 4.2.17-1 Land Use Types and Associated NAC (Impact) Values

23 CFR 772 Noise Abatement Criteria		
Activity Category	dBA Leq	Description of Category
A	57 (exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheatres, particular parks or portions of parks, open spaces, or historic districts, which are dedicated or recognized by appropriate local officials for activities requiring special quantities of serenity and quiet.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, and parks which are not included in Category A and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals
C	72 (exterior)	Developed lands, properties or activities not included in Categories A or B above; these typically include businesses and other commercial properties.
D	N/A	Undeveloped Lands.

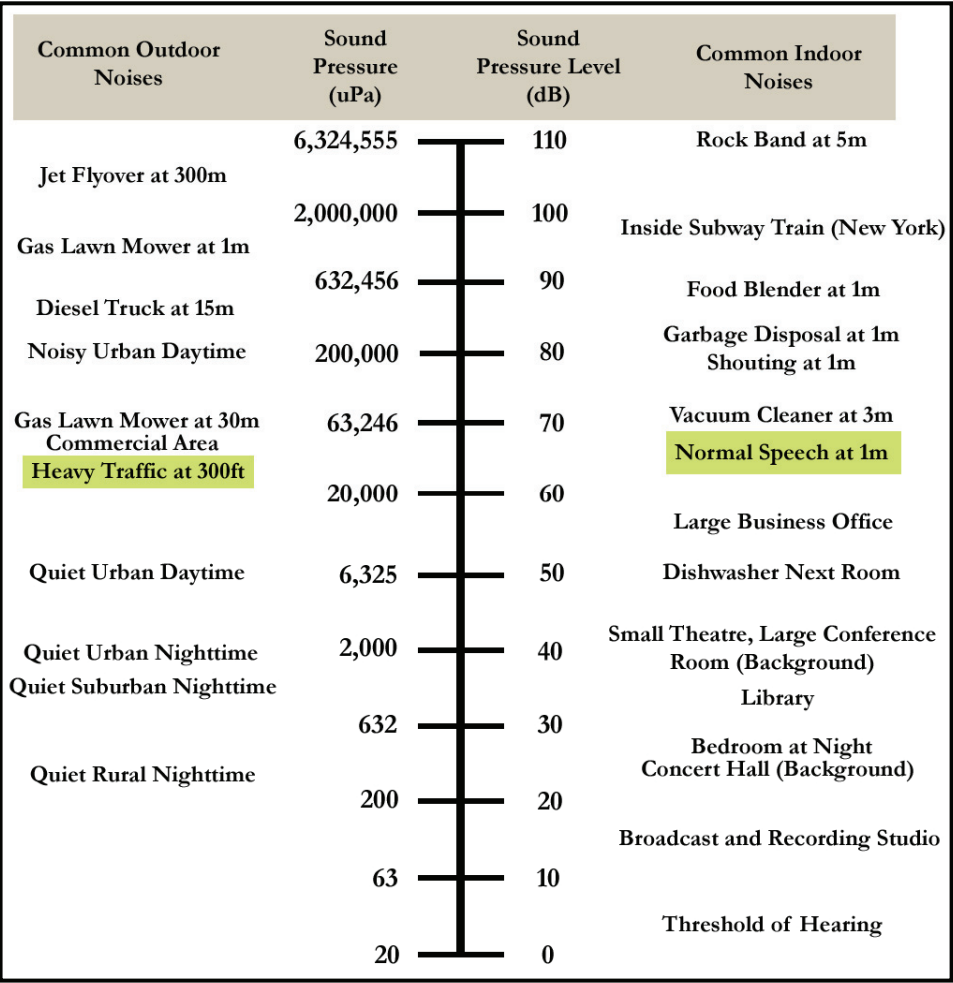


Figure 4.2.17-1 – Common Outdoor and Indoor Noises and Equivalent dB Levels

4.2.18 Existing Landscape Character, Visual Resources and Visual Quality

Methodology

The visual assessment methods used for this project are based on those employed by the U.S. Department of Transportation Federal Highway Administration (FHWA), which were developed in response the National Environmental Policy Act (NEPA) of 1969. A fundamental aspect of this methodology is the evaluation of the existing visual quality of views along a corridor compared with predicted visual quality after a project is constructed. It considers the relationship of the impacts to potential viewers within the project corridor and their sensitivity, as well as measures to avoid, minimize, or reduce the adverse impacts.

Landscape Districts, Character and Visual Quality

Landscape Districts

Initially the corridor is divided into a series of smaller Landscape Districts, which are based on 14-digit USGS hydrologic units, in order to:

- Gain deeper understanding of the intrinsic landscape qualities within the corridor.
- Help organize the Visual Assessment according to recognizable, smaller ‘places’ or ‘rooms’ in the landscape.
- Create better communication with people in the community by addressing issues within ‘places’ along the corridor instead of only referencing stationing or mile markers.

Please refer to figure 4.2.18-4 on the following page for a visual location of the Landscape Districts.

Landscape Character

Next, the existing Landscape Character and Visual Resources within each district are described in order to determine and understand the extent of visual changes arising from the project. These descriptions are based on observations of the following four major landscape components: Landform, Water, Vegetation and Man-made Development.

Visual Quality

The Visual Quality within each Landscape District is evaluated based on the following three attributes:

- Vividness: the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- Intactness: the visual integrity of the natural and man-built landscape, and the extent to which it is free from visually encroaching elements.
- Unity: the degree to which visual resources of the landscape form a visually coherent, compositionally harmonious pattern. Unity refers to the inter-compatibility between landscape elements.

Visual Quality measures the degree to which a view or set of views expresses the essence of a region. Those areas that possess the highest degree of expression of those features are identified as Exceptional Aesthetic Resources. The degree to which Exceptional Aesthetic Resources are impacted by a proposed project is crucial to consider during the alternatives evaluation process.

A description of the visual environment of the study corridor is necessary to determine and understand the extent of visual changes arising from the proposed I-66 project. The following descriptions highlight the distinctive landscape character and components, and the overall visual quality of each Landscape District along the project corridor. Viewer groups are also briefly described. The districts are presented in order from the west end near Somerset, to the east end south of London.

Flat Lick Creek District

This westernmost district of the corridor is a combination of rolling pastures and broad creek bottoms, primarily, interspersed with high, steep wooded knobs. Flat Lick Creek meanders across the district, which is sparsely populated with houses and farm buildings. Shopville and Barnesburg lie adjacent to the exiting KY 80 in the southeast corner of the district.

Views across the pastoral landscape and of the dramatic knobs are only slightly degraded by the presence of KY 80, and the overall visual quality of the district is rated moderate. Viewer groups include residents of Shopville and Barnesburg, farmers and other landowners, highway and county road travelers, people attending local churches and schools, or visiting cemeteries. There are also several eligible or listed historical structures within the district.

The Knobs District

This district is comprised of large wooded knobs or hills that are separated by small valleys up to a half-mile in width. The lower reach of Flat Lick Creek crosses the northeast portion of the district, with Stewart Branch being the largest tributary. There are fewer residences and homes in this area than in the Flat Lick Creek District, most likely due to the more undulating rolling topography.

Many of the views within the Knobs District are very picturesque and memorable. Except for the presence of KY 80 and a strip mine in the southeast corner of the district, the landscape components remain unified and intact resulting in a very scenic landscape with moderate to high visual quality. Any of the proposed Build Alternatives that diverge from the existing KY 80 corridor, if constructed, would disrupt pastoral views that some residents currently enjoy. Spelunkers (cavers) visiting either of two cave openings near Flat Lick Creek in the northeast corner of the district would be sensitive to visually discordant alterations in the landscape near the cave openings.

Buck Creek District

The western half of the this district is defined by the broad meanders of Buck Creek, which is a blue-line stream with outstanding water quality, high steep banks and exposed rock ledges. The eastern half of the district is etched by smaller creeks that course through more narrow valleys. Throughout the district, steep knobs rise 200 to 300 feet above the valley floor. Roughly half of the valley floor has been cleared for farming or other activities.

The karst landscape of this district contains the largest concentration of cave openings of any district in the project corridor. Another particularly unique feature is Short Creek, which is a sizeable stream that emerges from an opening in a rock ledge, only to disappear less than 100 feet downstream into another cave opening. The numerous rock ledges, caves and waterways have also contributed to the identification of several federally and state listed endangered species habitat areas. There are three eligible or suggested eligible historical structures within the district.

The presence of KY 80 and a large quarry that is located just north of the existing highway do little to detract from the moderate to high visual quality of the district. Natural resources like Buck Creek, Short

The pictures in this section show an example of the views described in each of the landscape districts.



Figure 4.2.18-1 – KY 80 Traversing Flat Lick Creek District



Figure 4.2.18-2 – Looking Southwest Across the Knobs District



Figure 4.2.18-3 – Looking South Across Road 1003 in Buck Creek District

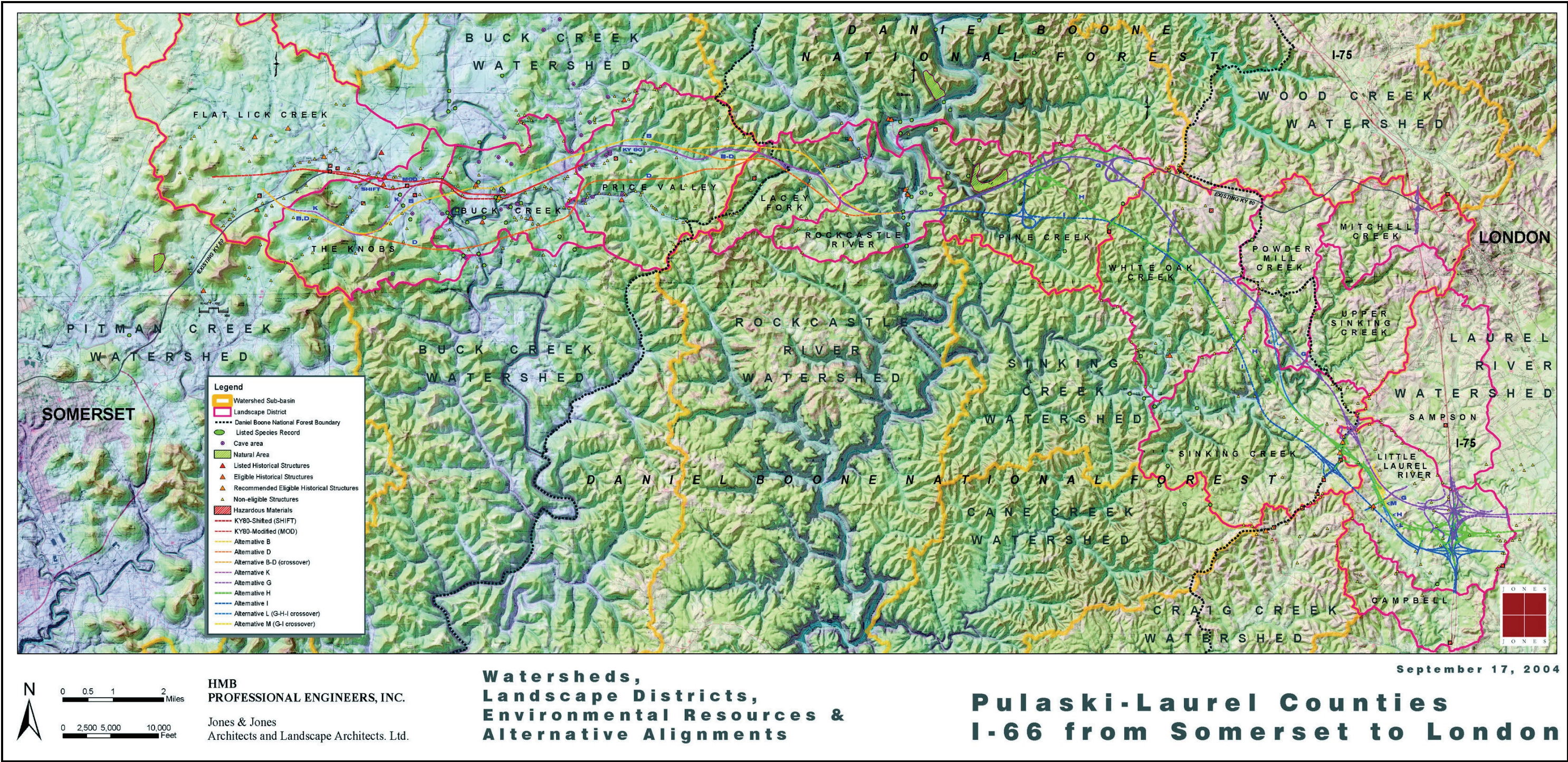


Figure 4.2.18-4 – Landscape Districts in I-66 Project Area

Creek, and publicly accessible cave openings can be expected to attract recreational enthusiasts and sightseers who would be sensitive to significant visual changes in the landscape. Buck Creek, from KY 80 to the south, is a popular class II paddling route, which passes scenic wooded hills, rocky cliffs and several cave entrances. Residents living some distance away from KY 80 would also be sensitive to the construction of a new roadway in their immediate surroundings.

Price Valley District

In this district, the terrain transitions from the knobs and rolling valleys, seen in districts to the west, to a landscape of steep high ridges and narrow valleys and ravines more characteristic of the Rockcastle River and Pine Creek Districts to the east. Two long, narrow valleys—Price Valley and Burdine Valley—traverse this area east to west. Existing KY 80 winds through Price Valley. Most residents and farmsteads in this district are located in Burdine Valley. Price Valley would be less impacted by the construction of a new roadway than would Burdine Valley.

There are at least eight cave entrances in this district, and one eligible historical structure. Due to the prominence of KY 80 in Price Valley, and the mixed visual quality of structures and landscape conditions within Burdine Valley, the overall visual quality of Price Valley District ranges from moderate to moderately high.

Lacey Fork District

The landscape of Lacey Fork District is composed of narrow valleys and ravines divided by steep, high irregular ridges. Most of the district is wooded with a few small pasture clearings occurring sporadically in the flat areas along the creek bottoms. The few local roads and scattered residences in the district are confined to the narrow valley floors. Most of the district is within the Daniel Boone National Forest.

Because of the rugged terrain and wooded cover, few distant views are allowed. Except for the presence of KY 80 and its associated massive rock cuts and fill banks, landscape features are largely intact, but the district lacks vividness and memorability. Visual quality of this district is moderate to moderately high.

KY 80 intersects with Old Highway 80 near where it crosses Lacey Fork. Access to the historical Whitaker Farm, the town of Billows and the Rockcastle River is

provided by Old Highway 80, which is used by residents, sightseers, hunters, boaters and other outdoor enthusiasts. Build Alternatives that diverge from the existing KY 80 corridor have the potential to severely impact the small number of existing residences and the visual quality of the adjacent hillsides.

Rockcastle River District

This mostly wooded district, within the Daniel Boone National Forest, has been deeply cut by the Rockcastle River and two of its major tributaries: Little Clifty Creek and Line Creek. High, steep, irregular ridges with spectacular rock ledges and cliffs border the river and creeks. The district has very few residents, and the ones that are there live along winding local roads in narrow valley bottoms or along ridges.

The Rockcastle River through this district is being considered for designation as a National Wild and Scenic River. The state of Kentucky also lists the river as a blue-line stream with exceptional water quality and riparian/aquatic habitat. The river and adjacent wooded hills and rock cliffs comprise a major natural, scenic and recreational resource drawing tourists and visitors year-round who canoe, raft, fish and hike the corridor. The Kentucky Wild Rivers Act (KRS 146.200 to 146.360) limits the location of the crossing of the Rockcastle River for the proposed I-66 project.

Just north of the KY 80 Bridge, the historical Whitaker Farm occupies a wide lowland bench on the west side of the Rockcastle River. The property has been identified as being eligible for listing on the National Register of Historic Places. The property also contains the Whitaker family cemetery, and a small burial site and monument to Native Americans. Visitors to this site, and recreational enthusiasts on or near the river comprise the most sensitive viewer groups in the area. Careful consideration will need to be given to the design of the new interstate and bridge to avoid increasing the visual impacts of the new roadway on these groups. Travelers on the proposed interstate will also be sensitive to visual impacts such as rock cuts, fill slopes, as well as the visual quality of the bridge structure. The visual quality of the district is rated moderately high to high.

Pine Creek District

Pine Creek District is composed of narrow steep ridges alternating with narrow valleys and ravines. Lower reaches of Pine Creek boast spectacular rock ledges

and cliffs. The steep corrugated terrain of this district is covered with deciduous forest vegetation and the entire district is within the Daniel Boone National Forest. Stands of old growth trees remain in this district and the Kentucky State Nature Preserves Commission (KSNPC) has recommended to the U.S. Forest Service that certain natural areas be protected.

A portion of the Sheltowee Trace crosses through Pine Creek District along a ridge between Pine Creek and Poison Honey Fork. The Trace is a 286-mile National Recreation Trail that follows the route used by Daniel Boone to lead settlers through the Cumberland Gap and into the Shawnee Indian Tribe’s sacred hunting ground in Kentucky. Today, hikers, mountain bikers, horseback riders and other nature enthusiasts, travel the Trace—it is an important multi-state as well as local recreational corridor.

There are also a few isolated residences just north of KY 80, and the Chestnut Knolls Aviation and Airpark owns and operates a 200ft grass strip and museum, dedicated to preserving grass roots aviation and sport aviation (including ultra-lights), to the south of the existing highway.

The natural terrain features and forest cover of Pine Creek District remain largely intact with the exception of the clearing and grading disturbance caused by KY 80 and the adjacent airstrip. The deep cliff-lined gorge of lower Pine Creek is quite spectacular and memorable. The verdant side creeks and ravines draining into Pine Creek and the stands of old growth forest are scenic and vivid. Pine Creek District is comparable to the Rockcastle River District in scenic value and is rated high in visual quality.



Figure 4.2.18-5 – Looking East Along KY 80 in Price Valley District



Figure 4.2.18-6 – Looking East At Fill Slope Along KY 80 in Lacey Fork District



Figure 4.2.18-7 – Rockcastle River Bridge Looking East



Figure 4.2.18-8 – Looking East Across Pine Creek Ravine

An important viewer group in Pine Creek District consists of recreational enthusiasts and outdoor enthusiasts. Backpackers, hikers, bicyclists and horseback riders traverse the district along the Sheltowee Trace—These individuals are pursuing activities in a very natural and undisturbed setting at a pace that allows a high level of environmental perception and awareness. Visually obtrusive or discordant man-made elements in this landscape will be easily perceived by this viewer group and stand to disrupt the recreational experience, seclusion, and enjoyment that is being sought. Much care will need to be taken to preserve the natural quality of this area and to prevent the construction of I-66 and any required interchanges from greatly impacting the experience of groups and individuals seeking seclusion and tranquility within this area.

White Oak Creek District

The terrain in this district transitions from steep narrow ridges and ravines (like districts to the west) to relatively broad rolling ridge tops with shallow ravines in the east part of the district. White Oak Creek and Little White Oak Creek have cut fairly deep troughs through the district that are bordered by high, steep ridges, which contain exposed rock ledges and outcroppings.

The terrain in the western two-thirds of the district is ruggedly corrugated woodland. The eastern one-third is composed of broad, rolling ridge tops that have been cleared for agricultural uses, interspersed with narrow and steep wooded ravines. Although mostly within the Daniel Boone National Forest, this district has a significant number of private inholdings within the DBNF boundary. A number of farmsteads and homes have been constructed along several roads that meander across the eastern portion of the district, while a substantial amount of office/warehouse development exists in the northeast corner of the district, near KY 80.

The western portion of this district has high visual quality and is scenic and memorable for its deep ravines and beautiful creeks. The visual quality of the northeast portion has been compromised by residential and commercial/industrial development and is rated low. Less intensely developed pastoral areas in the east half that are some distance from KY 80 have moderate to high visual quality.

Recreational enthusiasts, more likely to be found in the western portion of the district, will readily notice elements and features that do not relate to the forest setting and that are incongruous with their expectations. White Oak District’s resident population is considerably larger than that of districts to the west. Due to the significant amount of residential and commercial/industrial development, residents in the northeastern areas, near KY 80, will most likely have a lower level of visual sensitivity than residents in the southeast portion of the district, who live in a more pastoral setting.

Sinking Creek District

The landscape of this district is a contrasting combination of rolling uplands and deep narrow creek valleys formed by Sinking Creek and its tributaries, Clifty Branch, Griffin Branch and Laurel Branch. While the uplands have been cleared extensively for farming and are occupied by varying amounts of residential development, the rolling pastoral qualities of the landscape remain visually intact, unfragmented and scenic. Most of this district is within the DBNF—this district also contains a significant number of private developments that are inholdings within the National Forest boundary.

The narrow creek ravines and valley floors are lined with spectacular rock outcrops, cliff lines, seeps, springs and wooded steep slopes. These sinewy ravines have very few roads within them, or areas that have been developed. The overall visual quality of the Sinking Creek District is moderately high to high.

Because of their upland position, and the large size of a number of the properties, many residents in this district have expansive views that could be severely impacted by the construction of a new highway, depending on their proximity to it. Should the new roadway require the crossing of one or more of the spectacular ravines, much care will need to be taken to minimize impacts to the existing visual and environmental quality.

Little Laurel River District

The easternmost landscape district of the I-66 study corridor, the Little Laurel River District transitions to predominantly gently rolling upland hills, interspersed with occasional shallow ravines and lightly etched watercourses. Because of the moderate terrain, much of the district has been cleared for pasture. Trees and

understory vegetation remain along fence lines, drainage channels and within ravines. Dense bands of riparian vegetation line Ward Branch, Horse Branch and Little Laurel River. Interstate 75 runs north and south through the east side of the district.

Due to the proximity of the towns of London and Corbin and the gentle terrain, this district is undergoing a considerable amount of residential development, particularly in the eastern portion. Land use is a patchwork of farms with clusters of homes on varying lot sizes. While many parts of the district offer scenic views across open, rolling pastures, the district is rated moderate in visual quality due to the fragmentation of this pastoral landscape.

The Little Laurel River District supports the greatest number of residents of any of the landscape districts along the study corridor. Most homes are situated on higher ground along the tops or shoulders of the gently rolling hills. Many residents are afforded fairly distant views across the open landscape and could be significantly impacted by the construction of I-66 and the associated interchange with I-75, depending upon their proximity.

A discussion of viewer group exposure and sensitivity, along with potential mitigation for visual impacts is presented in chapter 5 of this document.



Figure 4.2.18-9 – Farmstead in White Oak Creek District



Figure 4.2.18-10 – Overhanging Cliff Near Sinking Creek



Figure 4.2.18-11 – Looking East Across Farmsteads and Residences in Little Laurel River District

4.3 The Social Environment

4.3.1 Land Use and Development

Existing and Planned Land Use

Land use patterns of the project area were determined through a variety of sources, including reviews of previous documentation, aerial mapping and windshield surveys of the entire project area.

Regional Summary of Land Use

Regional land patterns feature predominantly agricultural usage in the counties with the majority of mixed use development located within or adjacent to the county seats. County seats house municipal government services, and as a result, commercial and residential uses are located within or near the city limits. Outlying communities, such as Science Hill in Pulaski County and East Bernstadt in Laurel County are smaller towns with limited commercial development. Most of the land use in these communities is single residential with limited municipal government services.

Commercial land use in areas between the communities is limited to highway commercial (gas and food stores, auto repair services, etc. at interchanges along KY 80) or retail stores in small, unincorporated communities such as Shopville in Pulaski County.

Laurel and Pulaski Counties do not have comprehensive county-wide land use plans. Planning efforts for the region are addressed by the Cumberland Valley Area Development District (Laurel County) and the Lake Cumberland Area Development District (Pulaski County). ADDs grew out of the efforts of local elected officials and citizens in Kentucky to try and find mutual methods to address economic and growth challenges within communities.

The Area Development Districts (ADDs), serve as facilitators for cooperative discussions, clearinghouses, technical centers and as assembly points for their respective regions. ADDs have both federal and state statutory authority.

Both ADDs have identified the Interstate 66 project as a vital component in their efforts to facilitate economic

development within their respective regions, and it is complementary to their plans to provide economic development and regional linkage for this area of Kentucky to other parts of the country. Each ADD has cited the necessity for local officials and industrial/commercial development organizations to put forth efforts in recruiting and retaining industrial and commercial businesses, and that the Interstate 66 project is not a universal remedy, but an important component in the general process of stimulating economic growth.

Land Use in Laurel County

Land use patterns of Laurel County are typical of other areas of the State with similar environmental and economic characteristics. The greatest concentration of mixed-use development, including government, commercial and residential, occurs in the downtown business districts of London and Corbin. Land use density decreases in a radial pattern moving out from the central business district, with the exception of the major thoroughfares. Along the major roadways of the county, land use is denser with concentrations of industrial and commercial establishments in the vicinity of the I-75 interchanges.

Residential land use accounts for the majority of the developed lands in the area. Residential use includes both single and multi-family use, with single-family being the predominant use. Residential development is usually in close proximity to commercial areas, and typically fills in the areas between major roadways in both named developments and along local streets. Residential land use along major roadways includes isolated residences.

Commercial land use occupies a substantial amount of the developed lands in the project area. The downtown business districts contain many of these commercial establishments. In addition to the downtown business districts, there are additional areas of concentrated commercial establishments distributed throughout the study area. The areas surrounding the two I-75 interchanges are examples of these outlying commercial centers.

Industrial land use is generally concentrated in six distinct districts within the study area, each of which is located along a major thoroughfare with easy access to

the I-75 interchanges. Three of the industrial areas are within the city limits of London.

Public and semi-public uses include schools, parks, governmental buildings, cemeteries, and churches, which are distributed throughout the study area. Located within the city limits are the U.S. Court House, City Hall, Dyche Memorial Park (cemetery) and St. Williams School, state office buildings and State Police Post #11. Other public and semi-public land uses located in the study area include the London Post Office, Laurel County Middle and High School, Laurel County Community College, Laurel County Technical School, Sublimity and Cold Hill Elementary, the London/Corbin Airport and numerous cemeteries. Also located the area is Levi Jackson State Park, Daniel Boone National Forest, Laurel County Park, Fairgrounds and 4-H Camp.

Open/Agricultural land uses comprise the remainder of the lands in the study area. This land use type is typically situated on the outskirts of the project area and occupies the majority of land use in the unincorporated portions of Laurel County.

The London-Laurel County Joint Planning Commission maintains land use controls within the study area. Zoning regulations and building and housing codes are enforced within the city limits of London. Subdivision regulations are enforced throughout the remainder of the county. The last comprehensive plan for Laurel County was written in 1994. That plan is being updated, and according to local officials will consider all planned roadway improvements, including I-66 from London to Somerset. Therefore, the proposed project would be compatible with the future growth of Laurel County.

Land Use in Pulaski County

The majority of Pulaski County is rural, with Somerset as the main urbanized area of the county. The majority of land within the project corridor is rural agricultural, with the main crops being corn, soybeans, wheat and tobacco. Cattle and hogs form the majority of livestock farmed in the project area.

Urban land uses include residential, commercial, industrial, retail and service-oriented businesses. Residential and commercial land use radiate outward from Somerset along the major thoroughfares. Public

and semi-public facilities in the area include marinas, cemeteries and the airport.

The City of Somerset has planned for expansion, the details of which are contained in the document entitled *Somerset Comprehensive Plan 2000*. The controls described in this report utilize zoning to designate a variety of land uses. However, the county has no plan in place to control residential and commercial growth. City and County officials coordinate development issues informally. Consequently, the growth in residential and commercial land use has proceeded with no plan as to its direction and extent. The past growth has occurred primarily to the north and southwest of the commercial development occurring along US 27 and KY 80.

The population of Pulaski County has grown 15.5% from 1990-2002. This increasing trend is likely associated with the influx of individuals and families seeking retirement opportunities, recreational pursuits on Lake Cumberland, area medical services and educational/cultural resources in Somerset. Additionally, the county population is expected to grow by an estimated 13.9% between 2005 and 2030.

City and county officials along with the area’s industrial development foundation have been working to develop a systematic plan for industrial development in and around Somerset, which includes the designation of a new industrial park and a technology park near the intersection of KY 80 and KY 461 east of Somerset. Currently, the major concentration of industrial land use is located on the KY914 Bypass, situated south of Somerset.

No adverse impact is expected for any alternate on current or projected growth trends reflected in local plans and mapping or on projected industrial and economic development.

4.3.2 Demographic Characteristics of the Project Area

When comparing the population trends with employment figures and labor statistics in this study area, it can be inferred that the fluctuations in population are directly related to the employment conditions. The Kentucky Economic and Development Partnership and the Kentucky Economic Development Cabinet published a report May 2001. The report, *The Recent Economic Performance of Regions in*

Kentucky, stated that, “demographic and economic activity are intertwined. A changing population alters the demand for goods and services. Jobs then respond to people. On the other hand, job creation raises expectations for employment and attracts population. People then respond to jobs.” Reviews of population patterns and economic factors in this section have revealed this intertwining of relations for each county.

Statistical information is also vital in analyzing the populations of the project area to gain insight into the characteristics of the residents that would be affected by the action proposed. This includes identifying areas where minority communities, low-income communities and ethnic neighborhoods may exist.

Project Area Population

Project area population and demographic data were retrieved from various resources, including websites by the United States Census Bureau, University of Kentucky Atlas and Gazetteer, and the Kentucky State Data Center.

Project area population and demographic data was retrieved from various resources, including websites by the United States Census Bureau, University of Kentucky Atlas and Gazetteer, the Kentucky State Data Center, and the Pulaski County Government, the addresses of which are referenced in the back of the report. The population of Laurel County decreased slightly between 1990 and 2002, but it is projected to increase between 2005 and 2030 at a faster rate (30.1%) than Pulaski County (13.9%). The increased growth may be attributed in part to higher birth rates in Laurel County. Population projections are based upon historical growth patterns. Migration, mortality and fertility rates are incorporated by the Kentucky State Data Center to forecast changes in population. Migration rates measure the number of residents moving into and out of an area. Mortality rates measure life expectancies of residents, and fertility rates measure the number of births in an area. These factors are instrumental in assuming population forecasts. Upon reviewing these rates for Pulaski and Laurel Counties, the migration and mortality rates are very similar. Each county was categorized in the High/Moderate Mortality level. Laurel County’s cumulative fertility rate was higher than Pulaski County’s rate (2,034 to 1,950) over a five-year period. The migration rates for Laurel County are higher than

Pulaski County between 1995 and 2000 (12.8 percent and 7.1 percent respectively). Projections for Laurel County remain approximately 2 percent higher than Pulaski County through 2030.

Table 4.3.2-1 contains general population information and details the amount of change in population for the subject counties. Table 4.3.2-2 presents population projections for 2005 and 2030.

The population patterns are similar for both counties. Most of the residents are between the ages of 25 and 45. Slight increases are noticed in the 65 to 74 range. Conversations with local officials have indicated that the area is an attractive place for retirees to relocate.

4.3.3 Demographics

Demographics - Population Statistics

Demography, the statistical study of populations with emphasis on size, density and other attributes, aid in further defining the project area populations that may be potentially affected by the proposed project.

Minority Populations within the Project Corridor

Potential impacts to minority community members were assessed through examination of each U.S. Census Tract and Block Group impacted by the proposed Build Alternatives. In Pulaski County, Tract 9904, Block Group 5 and Tract 9909, Block Groups 1 and 2 were reviewed. In Laurel County, Tract 9703, Block Groups 1 and 2, Tract 9704, Block Groups 1 and 2, Tract 9710, Block Group 2 and Tract 9711, Block Groups 1, 2 and 3 were reviewed.

The data indicates that minority populations in the immediate area of the proposed Build Alternatives are lower than those in the remainder of the county. This is most likely due to the fact that the project is set in a rural area, with the greater concentrations of minorities occurring in the more urbanized portions of the project area counties. For example, Census Tract 9906, which is located in the urban area of Somerset, has 4,342 total residents, of which 4,098 are White. This area has the following number of minority community members; 155 Blacks, 11 American Indian/Native Alaskans, 21 Asians, 21 Hispanics and 36 of multiple-race. This area is 94% White, 3.6% Black, 0.2% American Indian/Native Alaskan, 0.5%

Asian, 0.5% Hispanic and 0.8% Multiple-race, with the remaining 0.4% of the population consisting of some other race not specified. Additionally, Census Tract 9706 in the urbanized area of London has 3,112 total residents, of which 2992 are White. This area has the following number of minority community members; 56 Blacks, 6 American Indian/Native Americans, 19 Asians 4 Hispanics and 35 persons of multiple-race. This area is 96% White, 1.8% Black, 0.2% American Indian/Native Alaskan, 0.6% Asian, 0.1% Hispanic and 1.1% Multiple race.

Table 4.3.3-1 presents racial composition of the project area counties.

Low Income Populations within the Project Corridor

Potential impacts to low income community members were assessed through examination of each U.S. Census Tract and Block Group impacted by the proposed Build Alternatives. In Pulaski County, Tract 9904, Block Group 5 and Tract 9909, Block Groups 1 and 2 were reviewed. In Laurel County, Tract 9703, Block Groups 1 and 2, Tract 9704, Block Groups 1 and 2, Tract 9710, Block Group 2 and Tract 9711, Block Groups 1, 2 and 3 were reviewed. Table 4.3.3-2, following, compares the poverty rates. Block Groups which exceed the Census Tract rates are presented in shaded cells. Impacts to these groups are addressed in chapter 5.

Table 4.3.2-1 Changes in the Population

Location	1990*	2002**	Number Change From 1990-2002	Percent Change From 1990-2002
Laurel County	52,715	54,313	1598	3.0%
Pulaski County	49,489	57,160	7671	15.5%
Kentucky	3,685,296	4,041,769	356473	9.7%

*Source: U.S. Census Bureau, Census 1990
**Source: U.S Census Bureau, Kentucky Quick Facts

Table 4.3.2-2 Population Projection

Year	Laurel County	Pulaski County	Kentucky
2005	57,109	59,092	4,209,882
2010	61,497	61,802	4,374,591
2020	68,708	64,722	4,660,703
2030	74,278	67,301	4,912,621

Source: http://ksdc.louisville.edu/kpr/pro/Summary_Table.xls

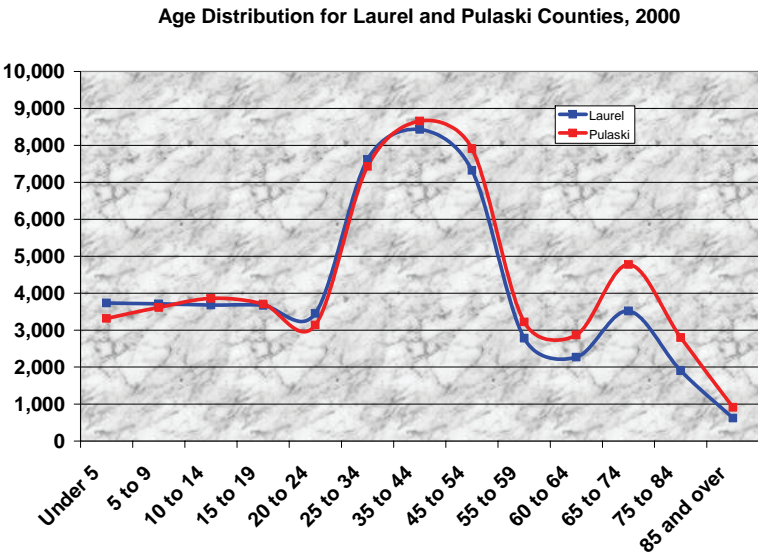


Figure 4.3.2-1 – Age Distribution for Laurel and Pulaski Counties, 2000

Table 4.3.3-1 Racial Composition

Race	Number Laurel/Pulaski	Percent (%) Laurel/Pulaski
One Race	52,239/55,839	99.1/99.3
White	51,484/54,798	97.7/97.5
Black or African American	331/604	0.6/1.1
American Indian and Alaska Native	193/123	0.4/0.2
Asian	182/208	0.3/0.4
Native Hawaiian	5/9	0.01/0.02
Some other race	44/97	0.1/0.2
Two or More Races	476/378	0.2/0.3

Table 4.3.3-2 – Poverty Rate Percentage

U.S. Census Area	Poverty Rate
Laurel County	21.3%
Census Tract 9703	22.8%
Census Tract 9703, Block Group 1	23.9%
Census Tract 9703, Block Group 2	21.4%
Census Tract 9704	13.5%
Census Tract 9704, Block Group 1	19.8%
Census Tract 9704, Block Group 2	9.4%
Census Tract 9710	24.7%
Census Tract 9710, Block Group 2	20.8%
Census Tract 9711	20.1%
Census Tract 9711, Block Group 1	15.5%
Census Tract 9711, Block Group 2	25.6%
Census Tract 9711, Block Group 3	26.8%
Pulaski County	19.1%
Census Tract 9904	16.8
Census Tract 9904, Block Group 5	11.8%
Census Tract 9909	19.3%
Census Tract 9909, Block Group 1	16.5%
Census Tract 9909, Block Group 2	20.9%

4.3.4 Employment and Economic Characteristics

Data for the project area were gathered to measure its economic vitality. The counties’ labor forces, unemployment trends, per capita personal income levels, major manufacturing activities, and poverty rates were measured and compared to educational attainment, commuting patterns and other factors to determine the types of jobs people in the area occupy and where they travel to work. Work force data indicates that Laurel County has a higher rate of unemployment (7.1%) than that of Pulaski County (5.5%) and the State (5.5%). The unemployment trend shows increasing rates for Laurel, Pulaski Counties, Kentucky and the Nation for 1999 to 2003. That trend has reversed for the first quarter of 2004, with unemployment rates falling for the project area, as well as the State. The unemployment rate for the Nation has remained at 6.0% from 2003 to March 2004.

The project area counties have both experienced economic growth in the years 2001 to present. However, the majority of growth has occurred in Pulaski County. Somerset/Pulaski County has added two new manufacturing plants creating approximately 258 jobs with an initial investment of \$7,000,000 dollars. Laurel County has added no new manufacturing facilities or jobs to the local economy. The expansion of existing facilities has occurred in both counties. However, Laurel County has experienced fewer expansions, added fewer jobs, despite having invested more funds in that growth area than Pulaski County. Table 4.3.4-1 details the economic growth for the project area.

The project area has a wide range of industry and commerce. Companies residing in the project area include automotive component manufacturers, bakeries, dairies, sawmills, mining and others. London reported an estimated 3,150 employees working in 19 manufacturing firms. Corbin reported 26 employees working in one firm, and 3,090 employees working in 20 manufacturing firms.

Somerset, as well as the region, is known nationally for the large concentration of houseboat manufacturers. Houseboat Magazine.Com lists thirteen such companies being located in the region surrounding Lake Cumberland, including the cities of Somerset, Monticello, Russell Springs, Columbia and Albany.

Industrial expansion is listed as a goal in the Cumberland Valley Area Development District and the Lake Cumberland Area Development District *Progress Kentucky Comprehensive Economic Development Strategy 2003* reports. Each county has at least one industrial park with available infrastructure such as water, gas, electricity, internal roads, telecommunication lines and other needs that are essential to attracting and maintaining light industrial and commercial businesses. The industrial sites are located less than 50 miles from an interstate highway or parkway. The respective Area Development Districts and area industrial firms have consistently cited adequate transportation infrastructure as a priority in relocating or expanding operations into a new community. The proposed roadway will allow more efficient transportation of raw materials, agricultural products, and finished goods, and will provide a safe means of travel for commuters between their residences and work destinations.

Commuting Patterns

Pulaski County reported a total of 22,884 workers 16 years of age and over. Sixty-five of those reported, 4.7%, relied upon public transportation as a means to commute to and from workplaces. A total of 21,541 (94.1%) workers relied upon cars, trucks, vans or motorcycles, and 340, or 1.5%, walked to and from their workplaces. Commuting time to work for Pulaski County’s labor force averaged 23 minutes in comparison to 24 minutes for Kentucky and 26 minutes for the U.S. Average commuting time for employees using public transportation in Pulaski County was 48 minutes in comparison to 36 minutes for the state and 48 minutes for the nation.

Laurel County reported a total of 21,180 workers 16 years of age and over. Seventy of these workers, 0.3%, relied upon public transportation as their means to commute to and from workplaces. A total of 20,009 (94.5%) workers relied on cars, trucks, vans or motorcycles, and 383, or 1.8% walked to and from their workplaces. Commuting time to work for Laurel County’s labor force averaged 23 minutes in comparison to 24 minutes for Kentucky and 26 minutes for the U.S. Average commuting time for employees using public transportation in Laurel County was 42 minutes in comparison to 36 minutes for the state and 48 minutes for the nation.

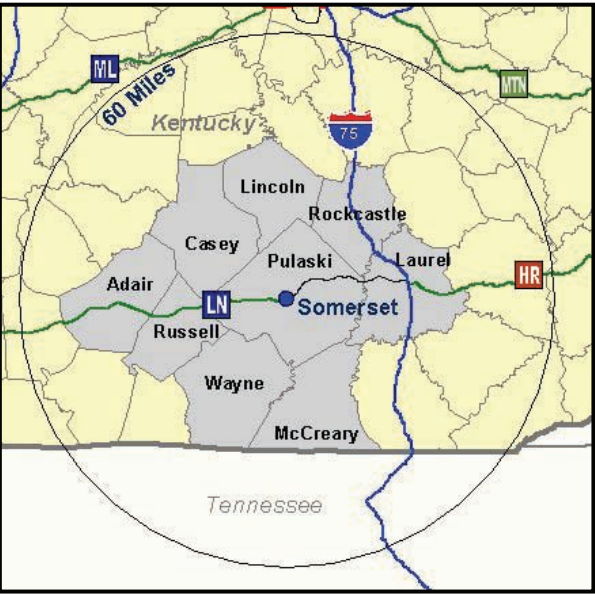
Following are depictions of the Labor Market Areas (LMAs) for Laurel County and Pulaski County. A county's labor market area is defined by the adjacent counties and all other major commuting counties. The shaded area represents the labor market area for the respective counties.

Reviews of U.S. Census Figures indicated that that the majority of commuters remain within their resident counties. Commuters leaving their home counties to travel to and from work are driving mainly to neighboring counties, and then to other counties within the LMA. The following displays are used to compare commuting trends of residents who would be likely to use Interstate 66 as a route to and from work. The displays include the destination counties, the number of commuters traveling to and from the project county to their work counties, and the corresponding percentage of commuters in comparison to all commuters within the county.

A total of 263, or 20% of Pulaski County’s commuters within the LMA travel to Laurel County for work. An additional 114, or 9%, travel to Rockcastle County. It would be likely that these 377 commuters would use Interstate 66 as a means to travel to and from work. Commuting patters for Pulaski county residents is shown in figure 4.3.4-3.

Table 4.3.4-1 Summary of Recent Locations and Expansions: 2001 – Present (Laurel/Pulaski)

	Companies	Reported Jobs	Reported Investment
Manuf. Location	0/2	0/258	\$0/\$7,050,000
Manuf. Expansion	12/25	337/473	\$55,544,900/ \$12,704,139
Supportive Service Location	1/1	275/150	\$2,329,300/ \$10,580,904
Supportive Service Expansion	1/5	15-20/249	\$0/\$530,000



A total of 204 commuters in Laurel County, or 5%, travel to Pulaski County for work. An additional 9 workers travel on to Russell County. It would be likely that these 213 commuters would utilize Interstate 66 as a means to travel to and from work. Commuting patterns for Pulaski county residents is shown in figure 4.3.4-4.

The secondary and cumulative impacts for commuters include a more direct, efficient means to travel between home and work. As populations increase in the area, more commuters would be likely to use Interstate 66.

U.S. Census 2000 County-to-County Worker Flow Files were consulted to gather data on commuters who would be likely to use Interstate 66 as a means to travel between their homes and workplaces. The counties within the defined LMAs were analyzed, and only other counties that would be situated in a logical pathway served by I-66 were considered. For instance, commuters living in Russell County and working in Laurel County were considered. Commuters living in Russell County and working in Adair and Casey Counties were not considered. Table 4.3.4-2 illustrates the estimated number of commuters for each county within the LMAs who may use I-66 as their primary means to travel between home and workplaces.

An estimated total of 3,502 commuters could use Interstate 66 as their primary means of traveling between home and workplaces. It is anticipated that residents of Pulaski and Laurel Counties may find jobs within their respective home counties as secondary impacts to economic development activities. As local officials continue efforts to recruit industrial and commercial companies, some commuters are anticipated to fill new vacancies. This would reduce some commuting activities outside Laurel and Pulaski Counties. However, general commuting activities are expected to increase if industrial and commercial expansion occurs on a continued basis.

Labor Market

The labor market for the Pulaski and Laurel Counties is similar when comparing numbers employed in the various sectors. The leading occupation in Laurel County and Pulaski County is sales and office work, followed by administrative and managerial. The production, transportation and material handling occupations are nearly equal to the second-ranked

sector of employment. The number of people employed in remaining sectors declines. Farming, forestry and fishing occupations employ the fewest individuals. Service-related companies employ the greatest number of project area residents, accounting for approximately 30% of the available workforce of both counties. Consistent with occupational data presented in the previous table, wholesale trade and transport is the second largest sector of employment, followed (in descending order) manufacturing, construction, information, public administration, mining, and agricultural.

Laurel County reported that 34.5% of its 2000 labor force was underemployed. Pulaski County reported that 19.5% of its 2000 labor force was underemployed. Underemployment involves underutilization of labor including underuse of skills, or underuse of employed workers. Workers with high level skills in low-wage jobs or employing workers who are not fully occupied (not producing goods or services). Unemployment rates have increased in both project counties and in the state. Table 4.3.4-3 compares unemployment percentages from 1999 through 2003.

4.3.5 Community Facilities and Services

Community resources were identified within Pulaski and Laurel Counties. These resources include parks, churches, shopping centers, schools, emergency services, libraries and government service centers. Government services, and major shopping, financial and other commercial areas are located within the county seats of Somerset and London. Emergency services, such as fire departments, are interspersed throughout the counties.

Existing Communities

In addition to the county seat of Somerset, Pulaski County has several communities, including Eubank, Science Hill, and Shopville. Shopville is located within the project corridor, and Alternates KY 80 Modified and KY 80 Shifted cross through Shopville.

4.3.6 Environmental Justice

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority and Low Income Populations,” ensures that federal departments and agencies identify and address disproportionately high

effects, and adverse human health or environmental effects of their policies, programs and activities on minority and low income populations.

Minority Populations

As reported in Section 4.3.2, Demographic Conditions, minority populations in the immediate area of the proposed Build Alternatives are lower than those in the remainder of the county due to the project’s rural setting. No negative or disruptive impacts are anticipated to minority communities or neighborhoods from any of the Build Alternatives.

Low Income Populations

Some low income families have been identified within U.S. Census Tract Block where the project Build Alternatives are being considered. As reported in Section 4.3.2, some of the Blocks contain higher percentages of low income families, those living below the poverty level, than the percentages for the Census Tract or the project counties. Field trips and conversations with local officials were conducted to determine if any family or socially interdependent clusters existed in the project area. A representative of the Laurel County Fiscal Court indicated that some low income families living in the Swiss Colony area would qualify as a low-income interdependent cluster, however in reviewing the location of the project maps and the families, he believed the project would be situated no closer than one mile from this group.

Interdependent Family Clusters

The Pulaski County Magistrate for the area near Shopville was contacted to determine if family or socially interdependent clusters resided in the eastern Pulaski County area. It appears that one such cluster may exist in Shopville near the elementary school, but the Build Alternatives that pass through this area will miss this group of residents.

Further discussion of impacts to environmental justice populations is addressed in Chapter 5.3.4.

For more detail on the socioeconomic study, including methodology and comprehensive socioeconomic data, refer to the Socioeconomic Baseline Report (October 2004).

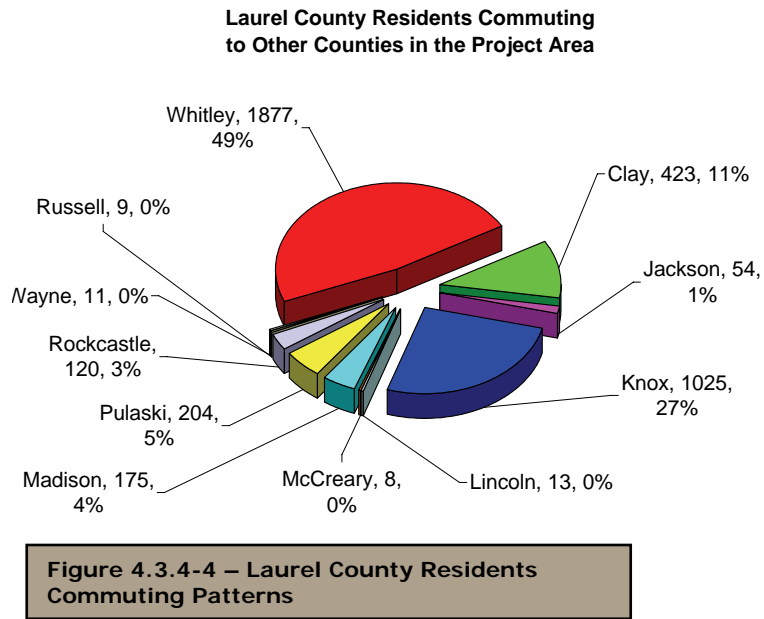


Table 4.3.4-2 Estimated Number of Residents in LMAs Whom May Use I-66 as Primary Commuting Route

County	Number of Commuters	County	Number of Commuters
Adair	87	McCreary	33
Casey	342	Madison	188
Clay	1020	Pulaski	558
Jackson	429	Rockcastle	243
Laurel	337	Russell	91
Lincoln	62	Wayne	
Whitley	58	Total	3,502

Table 4.3.4-3 Unemployment Rates in Percentages

Year	Laurel County	Pulaski County	Kentucky
1999	4.6	4.7	4.5
2000	4.0	3.7	4.1
2001	5.3	7.1	5.4
2002	5.9	7.1	5.6
2003	7.5	6.6	6.2

4.4 Cultural Resources

4.4.1 Historic Properties Regulations

This survey was conducted in accordance with the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation (National Park Service 1983), various subsequent National Register Bulletins, the June 2001 Specifications for Conducting Fieldwork and Preparing Cultural Resource Assessment Reports (Sanders), and the Federal Highway Administration/Kentucky Transportation Cabinet Joint Procedures for Implementing Section 106 of the National Historic Preservation Act (FHWA/KYTC 2001).

4.4.2 Historic Resources Survey Methodology

Archival Work

Prior to the beginning of fieldwork, all available surveys and reports, maps, and other data were identified and reviewed. Archival work was conducted at the Kentucky Heritage Council; State Historic Preservation Office (Survey Files, National Register Files, Previous Surveys, and Context Reports); the University of Kentucky Libraries, Special Collections (County Histories, Historic Maps, Context Materials); the Kentucky Historical Society Library (County Histories and Context Materials); the Kentucky State Archives; the Lexington Public Library, Kentuckiana Room (County Histories and Context Materials); and on the Internet at various historical and genealogical websites. The data collected from these sources has been used to develop the area overview, historic overview, and historic context sections of this report as well as to aid in the evaluation of the significance of individual surveyed resources. The resources identified as historic properties from these source reviews are included in the information presented for this project.

Summary of Previous Surveys in or near APE

Previous architectural surveys have been performed in the general project area that have resulted in the identification of a number of historic resources and have developed historic contexts applicable to the project area. The results of these surveys were utilized in the identification efforts for this project.

Field Work

Field work was conducted within the Area of Potential Effect (APE) identified in Phase 1A (large corridor) and Phase 1B (corridor narrowed to bands) of this project. While most of the bands were located within the original study area, two were located outside the Phase 1A study area. These new bands were used to develop a Phase 1B APE. The difference in area between the surveyed Phase 1A APE and the unsurveyed portions of the Phase 1B APE is 22,729 acres which represents the area surveyed in the second historic resources report to identify historic properties and evaluate their National Register potential. The APEs were approved by the Kentucky Transportation Cabinet, the Kentucky Heritage Council and the Federal Highway Administration. The coordination letters on the project APEs are included in Appendix B (coordination and comments). Figure 4.4.2-1, on page 4-23, shows the APEs developed for the corridor (Phase 1A) and the 1000 ft bands (Phase 1B).

Area of Potential Effect (APE)

According to Section 106, 36 CFR 800.16(d) of the National Historic Preservation Act (1966), the Area of Potential Effect (APE) is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.” 36 CFR 800.16(i) defines effect as “alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.”

The identification of an APE is an important early step in the Section 106 process, which allows the responsible federal agency – in this case, the Federal Highway Administration (FHWA) – to focus its historic property identification and assessment efforts in an area where the effects of the undertaking reasonably may be expected to occur. The APE is not a rigidly defined area and should be considered an identification tool that helps to focus identification efforts and that is subject to revision and refinement as more is learned about the undertaking and its potential effects.

Viewshed is the most commonly used factor for determining an APE because it is often the farthest reaching effect of a transportation project. A viewshed analysis should take into effect any obstructions due to terrain and vegetation eliminating these obstructed views from consideration in the APE. Other effects associated with highway construction including noise, vibration, and light should also be considered when determining a project APE but are often encompassed within the project viewshed and therefore not critical to the determination of the APE boundary.

For I-66, it was necessary that the initial APE be developed in order to account for effects on all potential historic properties located within several 1000ft study bands that were developed through early identification of project issues over a three county area and an extensive public involvement process which included participation by a local Citizens Advisory Group. Therefore, a broad area was initially designated as the project APE in order to begin identifying historic properties that may be affected by this undertaking. It was determined that the initial study area for the project APE should be expanded beyond a viewshed analysis to account for project effects within a one mile study area measured from each 1000ft study band. It was also determined that this one mile area of effect would not be restricted by any obstructions created by variations in terrain such as bluffs, ridge lines, and mountains which would normally reduce the total study area of the project APE.

With regard to noise impacts, the effect of traffic noise on surrounding properties is dependent not only upon traffic volumes and the distance between the roadway and receivers but also upon obstructions, especially structures and land forms, which can noticeably reduce the noise. As the distance from the roadway increases, noise sources other than highway traffic also become a contributing influence on ambient noise levels. A 5dBA increase over existing noise levels has been utilized as a criterion for APE determination on previous transportation projects since it generally represents a discernable increase in noise. This discernible effect of highway noise from construction of any alternative is expected to be within the project viewshed as well as the one mile buffer. Validation studies of the FHWA noise model have shown that beyond 1200 feet the ambient noise is the dominant contributor to the noise level and that meaningful

predictions of highway traffic noise contribution to receptors beyond this distance are unachievable. The current APE encompasses the potential effects of highway traffic noise.

Any effects of vibration would generally be limited to the highway right of way, with the possible exception of any blasting associated with rock cut construction. The effect of these construction activities is short term and will be controlled through timing and oversight of construction operations by the contractor to minimize disruption to nearby properties.

Light illumination created by the construction of I-66 would generally be limited to major interchange areas and perhaps the new bridge crossing the Rockcastle River. In both instances, this lighting is focused on a fairly constrained area to enhance the safety operations on the structure. Conventional interchange lighting generally involves a series of pole mounted lights on the interstate and ramps ranging in height from 30 feet on the ramps to 40 feet on the actual mainline roadway. The light from fixtures attached to these poles is focused primarily on the road surface and illumination of areas outside the roadway is very limited. As a result, further modification of the APE for potential light illumination is not required.

The boundaries for these individual effects were not delineated since the current one mile APE boundary as currently defined encompasses the farthest extent of all potential proximity effects associated with each alternative. The project APE remains subject to revision based on development of more detailed design information on each alternative and specific environmental effect of those alternatives. The technical studies included in this DEIS, along with the indirect and cumulative effects analysis will also provide information to be considered for any further evaluation of the APE.

Interviews with Local Residents

Throughout the project, knowledgeable local residents have helped by relating their particular area’s history. For every small community within the project, at least one person shared a wealth of knowledge, which in turn has helped in making the correct interpretations of various structures and settlement patterns.

4.4.3 Historical Trends and Historic Context

A detailed description of the project area, including historical population trends and community development is presented in the Historic Structures Inventory Baseline report. The baseline report includes development patterns and discussions of the various periods in the project area’s development, including the Exploration Period, the Settlement Period, the Antebellum Period, the Civil War, Early Industrialization and the Twentieth Century. The area and historic overviews presented in the baseline report establish the general historic trends found within the project area. The baseline report contains a discussion of the historic contexts that are developed for use as a framework for the evaluation of historic resources and include, Agricultural Theme (1865-1945), Domestic Architecture Theme, Religious Theme, Educational Theme, Commercial Theme, and Cemetery Theme. The overviews and contexts are incorporated into the survey and evaluation of each historic resource identified throughout the project.

4.4.4 Historic Property Identification

The purpose of the historic resources survey is to identify historic resources (defined as fifty years or older) in the designated project APE, determine their eligibility for listing on the National Register of Historic Places, and assess the project’s effect on eligible properties. To make these determinations, field research was conducted to assess all historic resources through written and photographic documentation. Further research was conducted in various archives and libraries to review the history of the area and develop a historic context in which to evaluate the historical significance of these resources. National Register evaluations of each site were then developed in accordance with Criteria A, B, and C, and boundaries were determined for all sites recommended eligible. Once alignments for the proposed highway were developed, each site was evaluated to assess the potential impact of the proposed highway. Kentucky Heritage Council survey forms were completed for surveyed sites and new forms completed for sites previously surveyed more than five years ago. Figure 4.4.4-1 (in Appendix C) shows the historic resources surveyed within the project area and identifies those properties determined on or eligible for the National Register of Historic Places. Table 4.4.4-1 lists the historic properties identified (Historic Property = on or

eligible for the NRHP). For a discussion of impacts to these identified properties, see chapter 5.4.2.

4.4.5 Archaeological Resources

4.4.6 High Probability Surveys

The purpose of this assessment was to locate, describe, evaluate, and make appropriate recommendations for the future treatment of any historic properties or sites that may be threatened by proposed construction activities. For the purposes of this assessment, a site was defined as “...any location where human behavior has resulted in the deposition of artifacts, or other evidence of purposive behavior at least 50 years of age” (Kentucky Heritage Council 2001:23). Cultural deposits less than 50 years of age were not considered sites, as per the guidance provided in the Secretary of the Interior’s “Standards and Guidelines for Archaeology and Historic Preservation” (Federal Register, September 29, 1983).

4.4.7 Archaeological High Probability Survey

The study area consists of six bands (B, D, G, H, I, and KY-80) and is 3,944 ha (9,746 acres) in size, of which approximately 152 ha (376 acres) were surveyed. The areas surveyed consisted of those considered high probability for significant archaeological sites. High probability area locations were based on the study conducted by CRAI in 2002 (Anderson 2003), which included the following:

- Areas near Buck Creek in Pulaski County;
- Areas near Rockcastle River in Laurel and Pulaski counties;
- Areas where cliffline have been recorded in, and near, the Daniel Boone National Forest;
- Areas where caves have been recorded;
- Areas close to natural springs;
- Areas where historic properties have been recorded; and
- Areas where structures are depicted on historic maps.

4.4.8 Archaeological Survey Efforts and Findings

Between September 29, 2003 and June 11, 2004, surveys were conducted for areas considered to have high potential for significant archaeological sites within the proposed Interstate 66 (I-66) expansion in Laurel and Pulaski counties, Kentucky.

Prior to the current survey, twenty archaeological sites (15L142-43, 15L171, 15Pu138, 15Pu145, 15Pu188, 15Pu216-219, 15Pu245, 15Pu249, 15Pu253-255, 15Pu257, 15Pu323-325, 15Pu328) had been recorded within the study area. Of these, 16 (15L142, 15L143, 15L171, 15Pu188, 15Pu216, 15Pu217, 15Pu218, 15Pu219, 15Pu245, 15Pu249, 15Pu253, 15Pu254, 15Pu255, 15Pu257, 15Pu324, 15Pu328) do not appear to have been evaluated for inclusion in the National Register of Historic Places. If these sites will be impacted by I-66, further archaeological investigation may be necessary.

As a result of the current survey, 26 archaeological sites (15L1339-347, 349-350 15Pu469 483), one non-site locality (NSL-1) and one isolated find (IF-1) were recorded. These sites consisted of historic cemeteries (15L1344, 15L1345, 15L1346, 15L1347, 15L1349, 15Pu473, 15Pu474, 15Pu475, 15Pu476, 15Pu477, 15Pu478, 15Pu479, 15Pu480), rockshelters (15L1339, 15L1340, 15L1341, 15L1342, 15L1343, 15L1350), historic farm/residences (15Pu471, 15Pu481), prehistoric open habitations without mounds (15Pu470, 15Pu482, 15Pu483), and indeterminate prehistoric (15Pu469, 15Pu472). Further archaeological investigation is necessary to evaluate 19 of these sites 15L1339, 15L1341, 15L1342, 15L1344, 15L1345, 15L1346, 15L1347, 15L1349, 15L1350, 15Pu470, 15Pu473, 15Pu474, 15Pu475, 15Pu476, 15Pu477, 15Pu478, 15Pu479, 15Pu480, 15Pu483) for inclusion in the National Register. The remaining seven sites (15L1340, 15L1343, 15Pu469, 15Pu471, 15Pu472, 15Pu481, 15Pu482) do not have the research potential to be eligible for the National Register and no further work is recommended.

Two cemetery locations, Reported Cemetery-1 (RC-1) and Reported Cemetery-2 (RC-2), were brought to the attention of the survey crew by local landowners. RC-1 is in Band KY-80 in Pulaski County. RC-2 is within Band I in Laurel County. No evidence of these cemeteries was found during a pedestrian survey of these areas. If these areas will be impacted by I-66, backhoe stripping of the topsoil may be necessary to identify grave shafts. If RC-1 and RC-2 are not backhoe stripped to identify grave shafts, it is recommended that an archaeologist monitor these areas during construction of I-66.

Based on the results of shovel testing and limited auger testing, the Buck Creek floodplain appears to have the

potential for buried cultural deposits. Although the Rockcastle River floodplain has been subject to survey (Soil Systems 1979), it has not been tested for its potential to contain buried cultural deposits. It is recommended that portions of Buck Creek and Rockcastle River that will be impacted by construction of I-66 be subject to backhoe trenching to determine their potential for buried cultural deposits. Trenches should be excavated at no less than a 50 m interval perpendicular to these streams. In portions of the floodplain where sites have been recorded, a 20 m interval should be used.

For more detailed methodology and for cultural overviews, county histories and previous archaeological research conducted in the project area refer to the Archaeological Survey Baseline Report (October 2004).

Table 4.4.4-1 I-66 Historic Properties

Historic Properties Identified in I-66 Project Area	
KHC NO.	Description
LL 11	First Evangelical Reformed Church
LL 69	Maple Grove School
LL 98	Sunny Brook School
LL 182	Johnson House on W. Laurel Road
LL 183	Wyan House on W. Laurel Road
LL 232	Old Cold Hill School
PU 59	Buck Creek Bridge
PU 62	James-Hansford House
PU 65	James Family Cabin
PU 71	Sowder Cabin
PU 221, 222	Whitaker Home Place and Cemetery
PU 224	Cooper School
PU 274	Burdine School No. 1
PU 297	Abandoned House
PU 301	Short Creek School
PU 337	Daryl Whitaker House
PU 375	Sinking Valley School House
PU 377	Leo Gilliland House
PU 60	Avis Harper House
PU 195	Abandoned House on Soules Chapel Road
PU 207	Flat Lick Creek Bridge on Barnesburg Road
PU 213	Jeff Harper House
PU 441	Phelps House on Pine Hill Road
PU 445	Sewell House
PU 452	Simpson House
PU 458	Edwards House
RK 43	Ruby Adams House
RK 44	Post Office and General Store at Billows

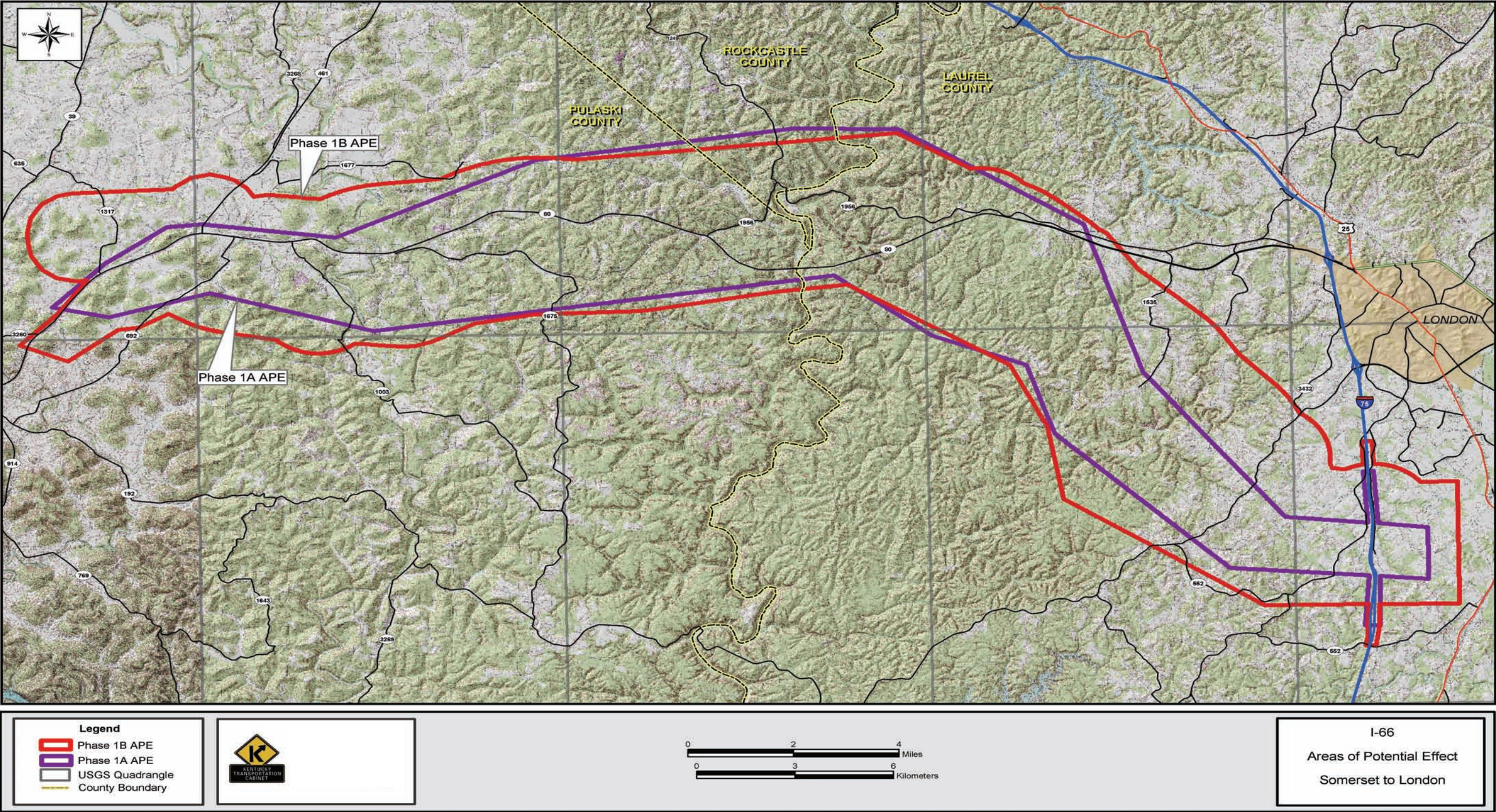


Figure 4.4.2-1 – Areas of Potential Effect for Phase 1A (Corridor Survey) and Phase 1B (1000 Foot Bands within this boundary)